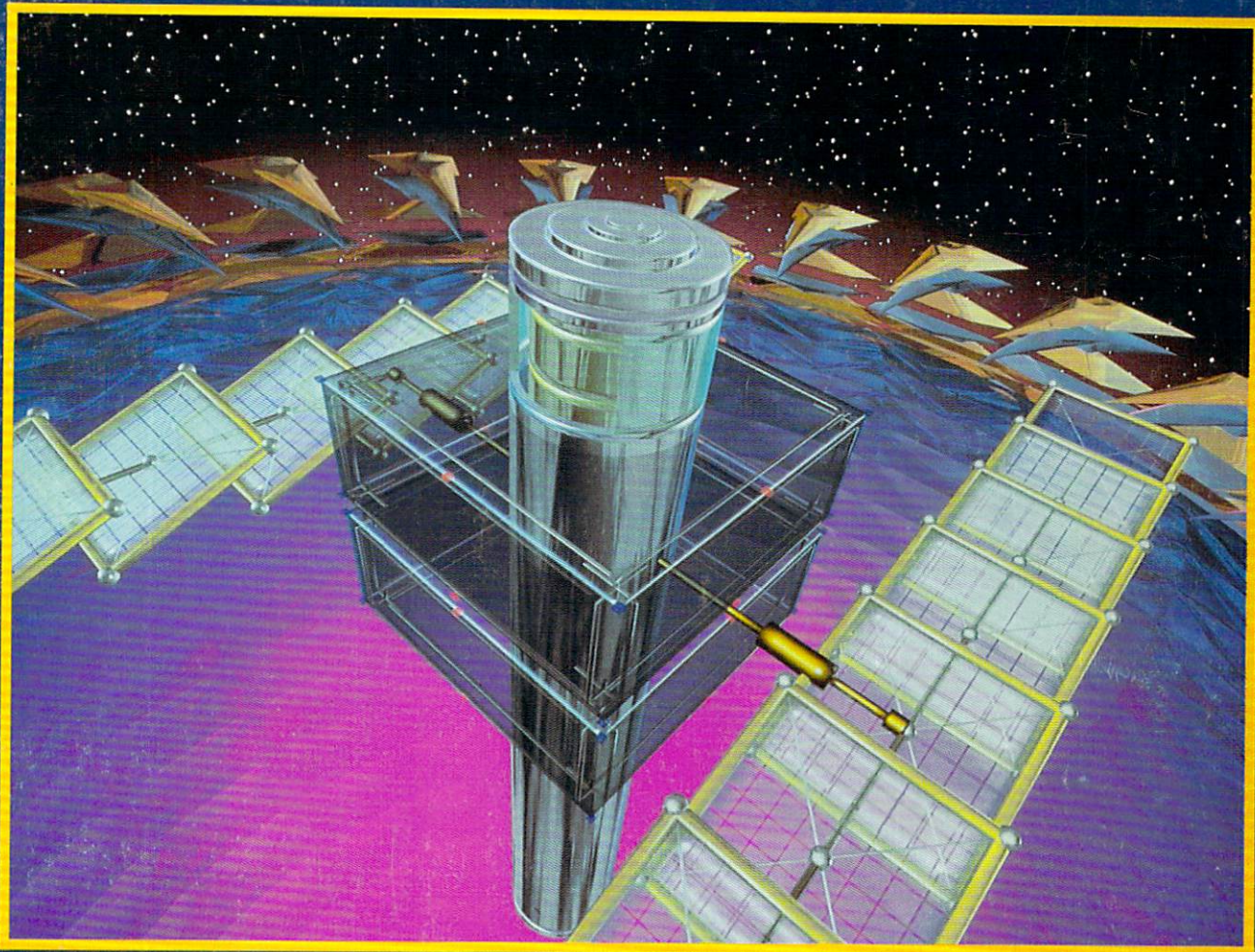


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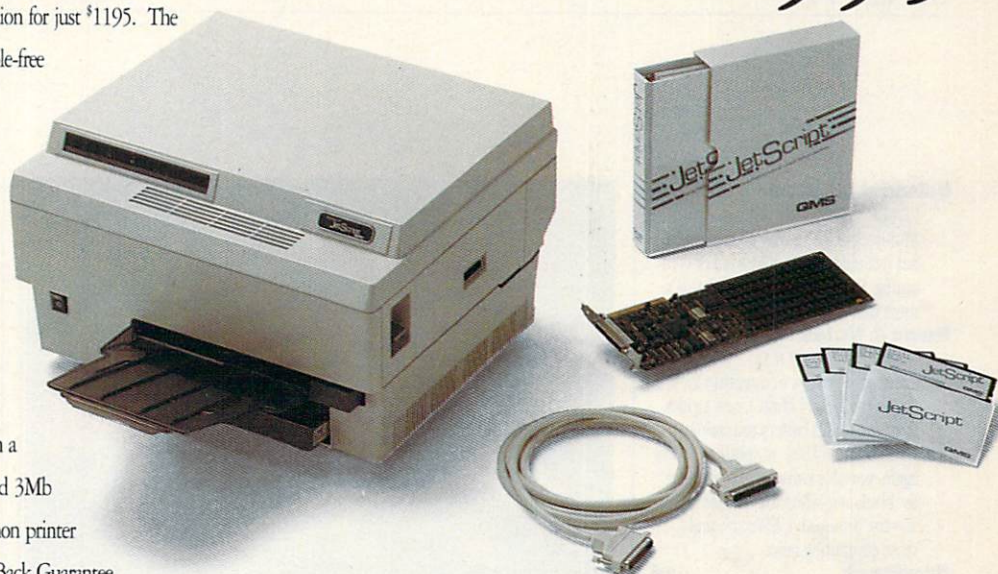
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64/128 VIEW

T O M N E T S E L

The results are in and tabulated for the 1990 Gazette Readership Survey. Thanks to all of you from around the world who took time to participate. We published some preliminary figures last month; now we'll look at the final figures.

It's interesting to note that 77 percent of you own a 64 and 42 percent own a 128. Looking back at results from previous surveys, these figures have changed little over the years. (Since many readers own more than one computer, the figures total more than 100 percent.)

It looks as though 20 percent of you are planning to buy another computer this year. Early figures had 28 percent of you moving toward IBM or its clones, but as surveys continued to arrive, that figure topped out at 38 percent. The big surprise is that 24 percent of computer shoppers say they'll buy a 128. Another 18 percent plan to buy a 64, 16 percent plan to buy an Amiga, and 4 percent say they'll buy a Macintosh.

The survey reports that 59 percent of you own modems and 25 percent of you use them to access a commercial online service. QuantumLink, which is Commodore-specific, is the service of choice for 50 percent of those reporting. CompuServe is next with 13 percent. Many readers reported calling local bulletin boards and smaller services. At least one reader taps into the St. Louis library computer five hours a month, and another spends at least half an hour a day logged on with the *Albuquerque Tribune* newspaper.

A joystick is the most frequently owned peripheral (93 percent), followed by a dot-matrix printer (84 percent), a modem (59 percent), a mouse (49 percent), an REU (36 percent), and a letter-quality printer (26 percent).

Subscribers to the magazine account for 89 percent of those responding. Of the 8 percent who get Gazette on newsstands, I hope those who live in this country have heard that now it's only available by sub-

scription in the U. S. Friends pass their copies on to 2 percent, and the remaining fraction get the magazine some other way.

Those with family incomes of less than \$20,000 account for 3 percent of the replies, and those with family incomes of more than \$100,000 account for 2 percent. The biggest share (40 percent) falls in the \$30,000 to \$50,000 range. Advertisers like to know how wealthy readers are. I hope they'll take notice that 96 percent of you say that you'd be interested in buying 64/128 disk products at affordable prices and that Gazette ads affect 83 percent of you. A whopping 97 percent of you buy computer products by mail, with 3.6 products per year the average. One person (in the \$100,000+ category, naturally) says he buys at least 40 titles a year.

The majority of *Gazette* Disk subscribers (63 percent) are satisfied with the product, but many of you said you'd like for us to lower the price. In case you haven't noticed, we've recently done just that. The subscription price is now \$49.95, down \$20.00 from last year. That's about \$4.00 a month for 12 disks and magazines. *PC* and *Amiga Resource* Disk subscriptions cost the same, but subscribers get six disks for that price.

Many of you (40 percent) want more *GEOS* coverage, 24 percent don't, 24 percent are undecided, and 12 percent didn't answer.

Finally, what about our new format? Since October we've received a lot of mail about our new look. Some of you have praised it; others have expressed disappointment. At least one reader threatened legal action unless we returned to the old format. We were curious what readers in general would say when asked their opinion. According to the survey, 40 percent of you like it, 29 percent don't, and 31 percent are undecided.

Next month we'll discuss what all these figures tell us and how they'll affect Gazette in the future. Once again, thanks for sharing your comments and suggestions with us. □

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NEWS & NOTES

Welcome to Metropolis

Metropolis is an online service for adult interactive-game enthusiasts, now available on Minitel (2900 Westchester Avenue, Suite 101, Purchase, New York 10577). Presented as an imaginary city rather than a database of services, Metropolis offers a wide range of interactive entertainment, including 21 multiplayer games, shopping, messaging, and chatting. The city contains Citizens' Directories, a Visitor's Centre, a Communications Centre, a Recreation Centre, and a Library.

For more effective interaction, Metropolis offers more than 75 action commands that include the use of body language and the expression of feelings and emotions. Subscribers can blush, dance, pinch, pout, whistle, whimper, scream, shrug, and create their own action commands.

Metropolis costs 16 cents per minute in the U.S. and Canada, but it can be reached by users in more than 20 countries. It's just one of the many online services offered by Minitel's worldwide network. Call (914) 694-6266 for free "Getting Started" software for the 64 or IBM.

Fly a Dragon

If you liked playing *Dragons of Krynn*, you'll love flying them into combat in *DragonStrike* (\$39.95) from SSI (675 Alamanor Avenue, Suite 201, Sunnyvale, California 94086).

Learn to fly dragons as you attempt more than 20 different missions in the DragonLance game world. Progress through three different orders of Solamnic knighthood, gaining bigger and more powerful fire-breathing mounts as you go. Collect all the magical items you can find; you'll need them in the fierce heat of dragon combat.

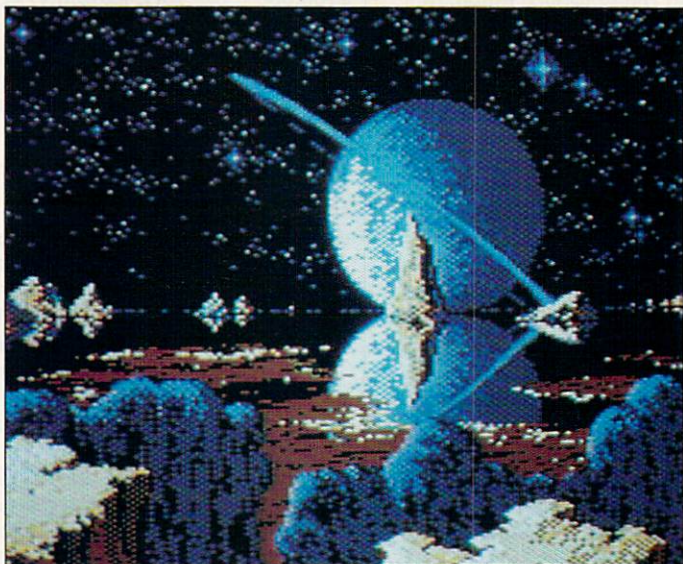
Seek and Destroy

Put on your camouflage fatigues and test your mapping skills with *Metal Gear* (\$14.95), a new release from Ultra Software (900 Deerfield Parkway, Buffalo Grove, Illinois 60089), a subsidiary of Konami.

Wind through five levels as you search for 20 special weapons and equipment to seek and destroy the title character and end the terror spree of the evil CaTaffy. Discover the weapons and equipment in enemy trucks and storehouses, or get them from certain soldiers of fortune.

As you try to capture weapons in your quest to rescue hostages, little do you realize that CaTaffy has unleashed against you the most powerful weapon of them all: Metal Gear. Luckily, you do have a few high-tech allies.

Your most vital tool is your transceiver, which lets you communicate with Commander South, who is at Fox Hound's Headquarters and feeds you crucial information on Metal Gear's location. The mission ends when you destroy Metal Gear—or he destroys you.



Far Out

Far Out by Jack Modjallal of Encino, California, is this disk's Picture of the Month.

Welcome to "Gazette Gallery." Each month *Gazette Disk* features a collection of the best 64/128 artwork submitted by our readers. We pay \$50 for each piece of art we accept and an extra \$50 for the one selected as Picture of the Month. Send original art to Gazette Gallery, COMPUTE Publications, 324 West Wendover Avenue, Suite 200, Greensboro, North Carolina 27408.

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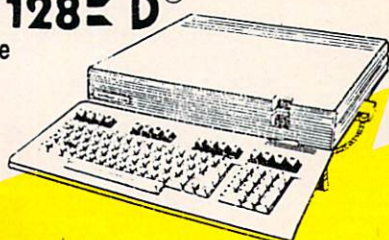
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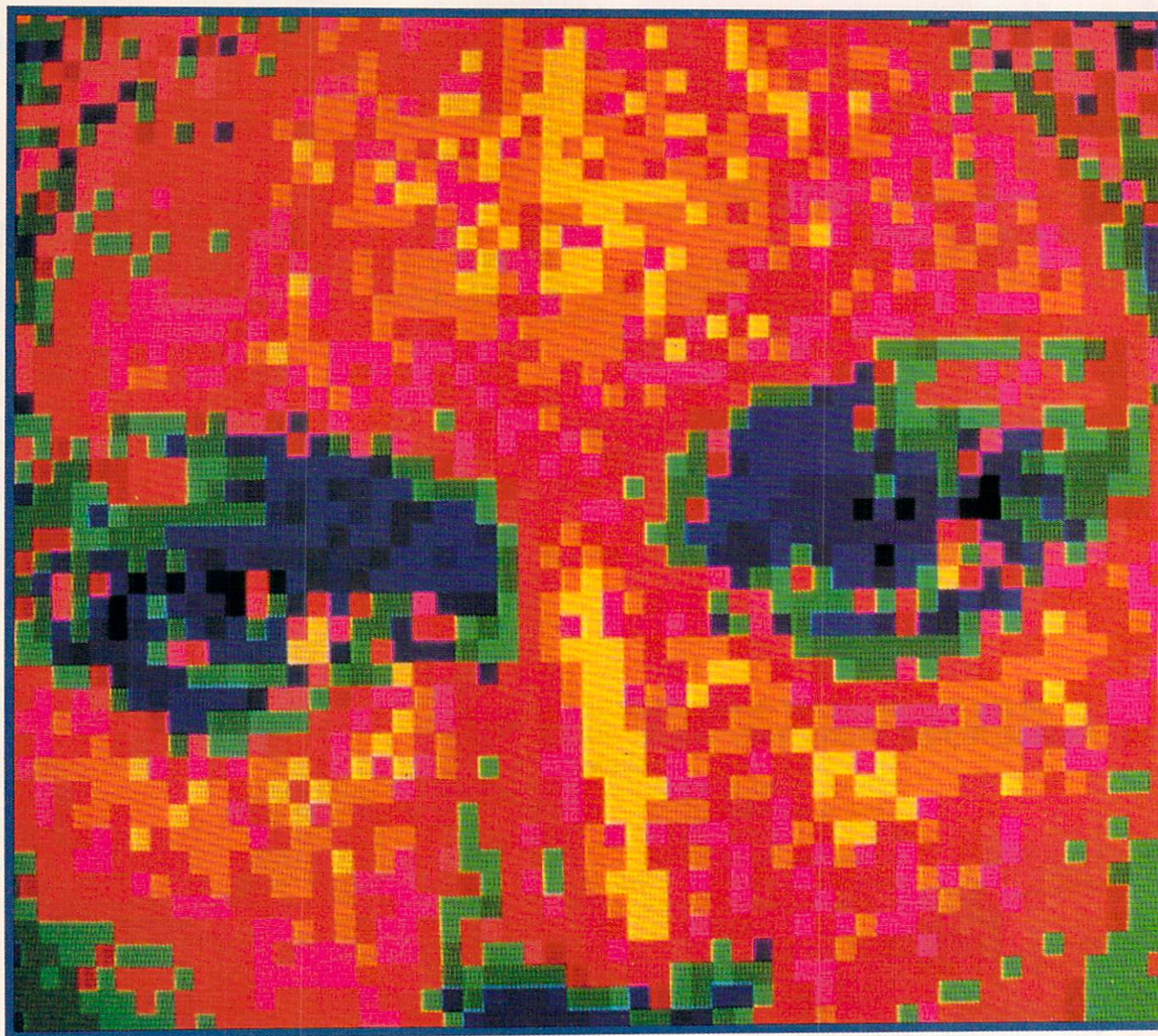
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If you're the type who can operate a camera but has trouble drawing a straight line, you'll appreciate a digitizer. With a digitizer and your 64, you can create your own custom graphics without having to master a drawing or painting program.

A digitizer is an electronic device which can convert a photograph, drawing, or video image into digital data (binary numbers) that can be stored and manipulated by your computer. These images can then be sent to a printer, combined with documents, or used as you'd use any other computer graphic.

There are two types of digitizers available for the 64. One is a scanner, an optical device used primarily for digitizing artwork, photographs, or other flat or printed material. (See "Take a Scan at This," an article about the Handyscanner 64, in our December 1990 issue.) The other type—the kind we'll examine in this article—works with a video signal, such as you might get from a video camera.

Video digitizers that operate with the 64 are not finicky; they'll accept a standard composite video signal from just about any video source, including camcorders, VCRs, and laser-disc players. Users must supply their own cameras or other video sources with the digitizers examined here.

Digitizers discussed in this article—ComputerEyes from Digital Vision and Video Byte II from the Soft Group—consist of cartridges that plug into the 64's user port, appropriate software, and instructions.

As a video signal enters a digitizer for processing, it requires from several seconds to as much as two minutes to digitize an image. These currently available video digitizers for the 64 are of the slow-scan variety. Even three seconds is a relatively long time in the video world, since a standard video display is completely updated at a rate of 30 frames per second.

If you work with either of these, in view of their slow-scan operation, a good freeze-frame feature on a VCR would be helpful. Since these digitizers work in black-and-white, a low-cost security camera would be a good choice for a video source. A simple black-and-white camera may even have a higher resolution than any of the color sources mentioned above.

ComputerEyes

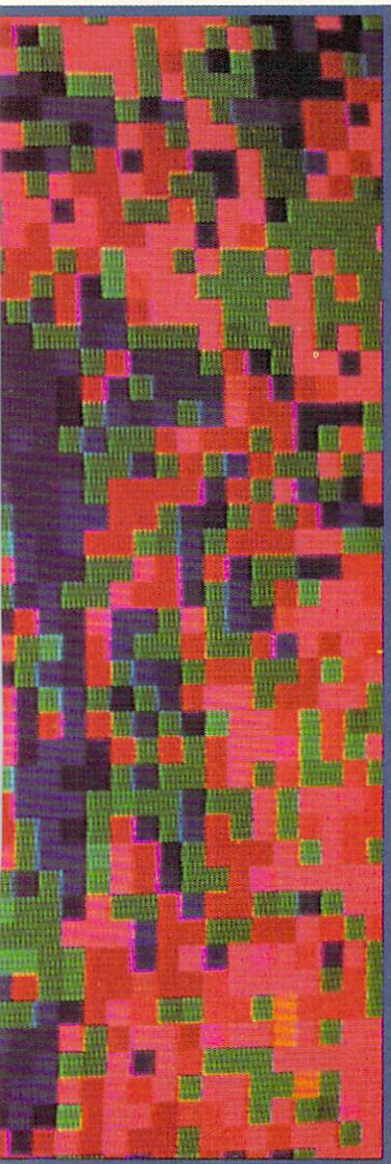
ComputerEyes consists of a hardware module, which plugs into the computer's user port, and supporting software on disk. Input of a video signal is through a standard RCA-type phone jack located on the side of the module's case. Two adjustments are provided; the first synchronizes ComputerEyes to your video source. This setting is easily done with the help of the supporting software. The second adjustment compensates for the brightness of the image or the intensity of the video signal. This rather sensitive setting has a direct bearing on the overall appearance of the image. A special scan mode lets you make a coarse adjustment of this control. The fine adjustment will have to be done very carefully by trial and error during the actual digitization process for best results.

The menu-driven software lets you capture an image in several formats. A single scan digitization creates a high-contrast black-and-white image in about six seconds. Four-level and eight-level captures can also be performed, requiring about 25 seconds and 50 seconds to complete, respectively.

All of the images are pure 8000-byte bitmaps in the 64's high-resolution mode, which results in an image that is 320 pixels wide by 200 pixels high. The separate color data, which is always black-and-white, is not saved to disk; instead, the gray levels are generated by dithering the pixels. This type of bitmap image is well suited for printing with a dot-matrix printer.

Although you can use the digitized images in your own programs, the basic ComputerEyes software doesn't save the images in a format compatible with any of the commercial graphics packages available for the 64. To generate a compatible file format with ComputerEyes, you'll also have to buy one or more of Digital Vision's compatibility modules.

Compatibility modules are available for a variety of graphics programs. The high-resolution modules support *Doodle-* and *Flexidraw-*format files. These modules add low-contrast and high-contrast capture modes to the three modes already built into the basic software. These extra capture modes make use of all five of the 64's gray levels (black, white,



THE IMAGE BANK



This is a ComputerEyes four-level capture in Koala format.



Here's a ComputerEyes eight-level capture in Doodle format.



The GEOS ComputerEyes driver is available from Quantum Link.



Video Byte can capture an image in about three seconds.



Video Byte can create pseudocolor images in Koala format.

and three shades of gray). Since these modes don't rely on bitmap dithering to generate their shading, they have more detail and finer gradation than the basic capture modes.

The multicolor module supports the Koala file format. Images in the 64's multicolor display mode are only 160 pixels by 200 pixels. The 64 trades off the lower resolution of the image for greater color flexibility in the display. As a result, the gray-scale captures in Koala format can produce a more natural-looking screen display than any of the high-resolution capture modes.

ComputerEyes compatibility modules are also available for capturing clip-art images that can be used with *The Print Shop* and *The Newsroom* page-layout programs. *GEOS* users have access to what is arguably the best ComputerEyes compatibility module. The *GEOS* ComputerEyes driver, which was created by Berkeley Softworks, is available for downloading from Quantum Link, or on disk from *Geoworld* magazine. This driver creates super bitmaps that are 640 pixels wide by 400 pixels high. The images are saved to disk in *geoPaint* format. Three scan modes are available: a high-contrast black-and-white mode, a four-level dithered gray-scale mode, and an eight-level dithered gray-scale mode. The four-level and eight-level modes produce images that print out very well. Scanning times are approximately 20 seconds, one minute, and two minutes, respectively, for the three *GEOS* capture modes.

If you're interested in buying ComputerEyes, you'll have to hustle to get one. Digital Vision has indicated that it's ceased production of the 64 version of ComputerEyes. It will no longer be available once the current stock of hardware and software runs out, although Digital Vision will continue to provide user support as required. Used cartridges should be available from private sources.

Video Byte II

Video Byte II from the Soft Group consists of supporting software and a standard-size 64 cartridge that plugs into the computer's user port. The video signal is fed in via a three-foot length of shielded cable, which terminates in a standard RCA-type phone plug.

There are no external adjustments, since the unit comes preset from the factory for a standard video signal. The lack of external adjustments could be a problem if your video source is slightly out of calibration. One solution is to buy a low-cost video enhancer to adjust the level of the signal. If you're the adventurous sort

and don't mind violating your warranty, you can pry open the Video Byte plastic cartridge to make adjustments. Inside are both coarse and fine adjustments for the video signal level.

The menu-driven software lets you capture an image in only the multicolor format, which is 160 pixels wide by 200 pixels high. The initial scan is in black-and-white, using four of the five available gray levels (black, white, and two shades of gray). The image capture time is only about three seconds. The short scanning time makes it possible for Video Byte to digitize live video if the action is relatively calm.

The software lets you adjust the overall tone of the image by shifting it into the third shade of gray. The software can also generate pseudocolor images by cycling through the 16 available screen colors. Colors can be cycled either one at a time or with all four colors at once. The digitized images are saved to disk in Koala format.

Video Byte can keep two digitized images in memory at once. The color map of the displayed image can also be stored for subsequent recall. This lets you quickly restore the original appearance of the image in case you've drastically modified it by the program's color controls.

Conclusions

ComputerEyes and Video Byte II produce comparable images in multicolor format, which are suitable for display on the monitor or for modification with a paint program. Video Byte's three-second capture makes it the one to use for digitizing live video. ComputerEyes is the more versatile unit, as it supports both of the 64's graphic display modes and a variety of file formats. *GEOS* users in particular will find that ComputerEyes can be a good source of clip art for their projects.

On the other hand, Video Byte is still readily available and sells for about \$50 less than ComputerEyes. For the money you save, you might want to invest in the Soft Group's Explode V.5 cartridge. This disk drive and printer cartridge allow you to print pictures both in color and sideways on your color dot-matrix printer. □

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KEYBOARD

art

All graphics are not created equal. High-resolution and multicolor graphics get all the praise and respect, but what about low-resolution (lo-res) graphics? They're the Rodney Dangerfield of graphics.

Lo-res graphics may not get much respect from serious computer artists, but they can be fun. Lo-res art is not as beautiful or as complicated as hi-res and med-res art, but it's quick and easy on a 64 or 128, and it's right there on your keyboard.

The standard letter and number keys provide 40 or so characters, including +, -, <, >, and /, but there are another 56 graphics characters available to Commodore users. These symbols, which you see printed on the front of many keys, can be accessed by pressing either the Shift key or the Commodore key while depressing the desired key. For example, in immediate mode you can create a circle by pressing the Shift key and the U and I keys, pressing Return, cursoring up to the line just beneath the semi-circle you've just created, holding down the Shift key again, and pressing J and K to complete the circle.

Screen-capture programs such as *Printmaker* (*COMPUTE's Gazette*, January 1986) and *Screen Store* (May 1990) can be used to design a lo-res display. For many beginning programmers, however, the simplest approach could be typing the graphics directly into a BASIC program.

D O N
R A D L E R

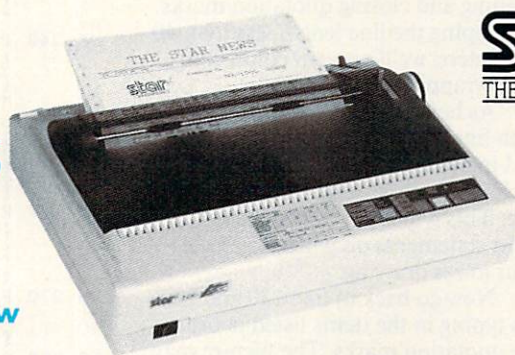


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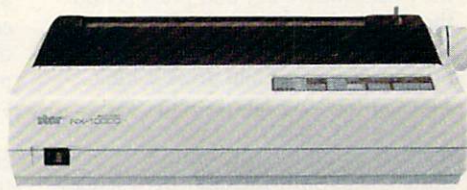
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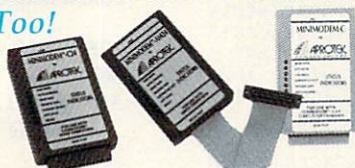
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Let's create a simple face to begin with; then we'll try something larger. Start by creating six lines of print statements with ten spaces between the quotation marks. Type in the following line and then press Return.

```
10 PRINT"(10 SPACES)"
```

To quickly duplicate this line, cursor up to the 10, type 20, and Return. Repeat this process, changing the number each time, until you have six lines numbered 10-60.

Now list your program. These six blank lines will be your workscreen for creating a lo-res drawing. Cursor up to line 10, and just to the right of the first quotation mark, hold down the Commodore key and press A and then S. Cursor to the right five spaces and press Commodore-A and Commodore-S again. Then press Return. These will be our face's eyebrows.

On line 20, start to the right of the first quotation mark and press Shift-U and Shift-I. Cursor five spaces to the right and press Shift-U and Shift-I again, followed by Return. These will form the top halves of the eyes.

On line 30, complete the eye by pressing Shift-J and Shift-K. Then move one space followed by a Shift-M, a space, a Shift-N, a space, and then Shift-J, Shift-K, and Return.

On line 40 we'll continue the nose. From the first quotation mark, cursor over four spaces and press Shift-Y, space, Shift-T, and Return.

On line 50, move in four spaces and press Shift-J, space, Shift-K, and Return to complete the nose.

On line 60 we'll create a mouth by moving in two spaces from the first quotation mark and, while depressing the Commodore key, pressing Q, E, R, E, R, E, and W. Then press Return.

By this time you should be able to see the simple face you've drawn in the listing. Now run the program and see if a face appears. In case you got lost in the previous instructions, here's the listing in our usual format.

```
KR 10 PRINT"{A}{S}{5 SPACES}
{A}{S}"
BC 20 PRINT"UI{5 SPACES}UI"
SH 30 PRINT"JK M N JK"
EF 40 PRINT"{3 SPACES}Y T
{4 SPACES}"
MH 50 PRINT"{3 SPACES}J K
{4 SPACES}"
GQ 60 PRINT".{Q}{E}{R}{E}{R}
{E}{W}{2 SPACES}"
```

With a few simple modifications, a FOR-NEXT loop, and a delay to slow the action, you could easily make the face blink its eyes or change its expression. You might want to try adding color to your design. This will

require heavy use of the Inst/Del key. Doing a drawing in this order, however, keeps it from getting too confusing when you start to modify it. Of course, text can be added at any point to turn your sketch into a title screen. Touches like these are limited only by your imagination.

Now let's try a bigger example by drawing a polar bear. First, set up 20 lines of print statements as you did earlier, but this time start from 130 and insert 25 spaces between the opening and closing quotation marks. By keeping the line length less than 40 characters, we'll prevent confusion with wrapping lines.

As before, instead of typing in each line 20 times, just cursor back and increase the line numbers by 10 each time, pressing Return after each one. This will give you a screenful of print statements on which to create your lo-res drawing.

Now go back to line 130 and begin typing in the items listed between the quotation marks. The picture may be difficult to discern from this listing, but it should appear in your print statements as you type them in. The Shift key and the Commodore key are used quite frequently.

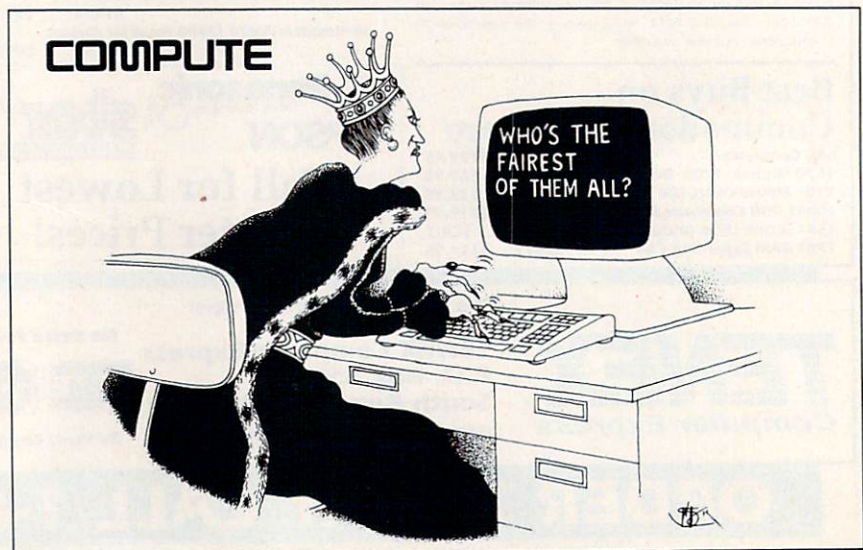
```
HH 100 POKE53280,15:POKE53281,
15
BF 110 REM BY DON RADLER
RG 120 PRINT"{CLR}{DOWN}
{6 SPACES}POLAR BEAR
{DOWN}"
CM 130 PRINT"{6 SPACES}N{U}N
{4 Y}{M}{U}{M}{8 SPACES}"
KF 140 PRINT"{6 SPACES}MN
{6 SPACES}MN{8 SPACES}"
BH 150 PRINT"{7 SPACES}{H}NP
{2 SPACES}OM{N}
{9 SPACES}"
HX 160 PRINT"{7 SPACES}{H}ON
{2 SPACES}M{N}
{9 SPACES}"
CM 170 PRINT"{7 SPACES}{H}
{2 SPACES}UI{2 SPACES}
{N}{9 SPACES}"
```

```
BA 180 PRINT"{7 SPACES}M
{2 SPACES}JK{2 SPACES}N
{9 SPACES}"
RX 190 PRINT"{6 SPACES}N M JK
{SPACE}N M{8 SPACES}"
BC 200 PRINT"{5 SPACES}N
{3 SPACES}{Y}{PO}{Y}
{3 SPACES}M{7 SPACES}"
QC 210 PRINT"{4 SPACES}N
{12 SPACES}M{6 SPACES}"
AJ 220 PRINT"{4 SPACES}{H}
{3 SPACES}{H}{4 SPACES}
{N}{3 SPACES}{N}
{6 SPACES}"
QJ 230 PRINT"{4 SPACES}{H}
{3 SPACES}M{4 SPACES}N
{3 SPACES}{N}{6 SPACES}"
HK 240 PRINT"{4 SPACES}{H}
{4 SPACES}M{2 SPACES}N
{4 SPACES}{N}{6 SPACES}"
GH 250 PRINT"{4 SPACES}{H}M
{2 P}{2 SPACES}MN
{2 SPACES}{2 P}{N}{N}
{6 SPACES}"
AM 260 PRINT"{4 SPACES}M
{3 SPACES}M {M}{H} N
{3 SPACES}N {3 @}
{2 SPACES}"
XB 270 PRINT" {2 T} N{2 U}M{M}
{M}{H} {H}N{2 U}M
{4 @}"
AR 280 PRINT"{4 SPACES}{H}
{2 SPACES}{N}{2 SPACES}
NM{2 SPACES}{H}
{2 SPACES}{N}{6 SPACES}"
EX 290 PRINT"{4 I}L{2 R}M
{4 P}NL{2 R}{6 I}"
```

Once you have your basic drawing, it's easy to add a little action. For example, add a simple FOR-NEXT loop and a line of text to show how cold a bear can be.

```
125 FORI=1TO6
300 NEXT
310 PRINT:PRINT"GOSH, IT'S
COLD!"
```

Elegant? No. Sophisticated? Not exactly. But with a little thought, you can be quite creative just by tapping a few keys. And it's fun. □



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REVIEWS

WORD PROCESSOR UPDATE • VAMPIRE ADVENTURE COMPUTER CHECKS • AWESOME DUDES IN HISTORY

WORD WRITER 5

Everyone has a pet (not necessarily a PET) word processor. It may be the first one you used or perhaps one whose unique features meet your special needs. For most people, learning to use a new word processor is a headache—too much time invested for too little return. Not so with Timeworks' *Word Writer 5*.

Word Writer 4 was a winner. It had all the features found in a good word processor—plus a calculator, a basic outline processor, an expandable 85,000-word spelling checker, a word counter, a basic form-letter printout, a 60,000-word thesaurus, eight ready-made fonts, and the ability to import fonts from *GEOS*.

Word Writer 5 offers these features and more. It has two more fonts, a second macro capability (handy for predefining often-used phrases or functions), automatic linking of files, forced page breaks, letter case change, and variable text layout.

The most significant change is one that takes *Word Writer 5* beyond the standard word processor. It comes with its own Art Library and a converter program that allows you to import graphics from *GEOS* or *Doodle*. Included are two conversion tables and a special program to help you place any graphic in a specific location without a lot of trial and error.

There are a few limitations. While text can be placed to either the right or left of a graphic, it cannot flow around a graphic. Two graphics can't be placed side by side. Still, it's an excellent way to handle small jobs without pulling out a desktop publisher.

Two templates and a help screen allow you to work almost manual free, although the manual is thorough and logical. It even includes a segment on understanding your printer—something we all could use a little help with. Quick-Start Mini-Manual lives

up to its promise to get you up and running within an hour, and customer support is available by telephone.

My criticism is limited. *Word Writer 5* can skip lines only by repeated Returns. Text-formatting commands can't be strung together on a line, and there's no definable or relative autoindent. On the other hand, some features are accessible in more than one way. Perhaps this duplication could be eliminated, and the freed-up keys could be used for something else. I'd like to see more macros—and see them saved within the text file so that those pertinent to a file would reload with it. A criticism of *Word Writer 4* not addressed in the fifth edition is the lack of a bridge back to the Install program. Since the Install program is where you convert and load fonts and graphics, it would be more convenient to be able to reach it without exiting and reloading the program.

So, what about us sticks-in-the-mud who like our old word processors? Well, truthfully, I still prefer my original one. It has some features that *Word Writer 5* doesn't have, and besides, we understand each other. But is there room in my life for *Word Writer 5*? Yes, because it has font and graphics capabilities not found in most word processors. It's a way station between my word processor and my desktop publisher.

I can heartily recommend *Word Writer 5* to those of you new to word processing. It's a solid product that packs the power of a good word processor and adds the punch of graphics capabilities. There's a place on almost everyone's shelf for *Word Writer 5*.

ROBIN JOY MINNICK

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TIMEWORKS
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CASTLEVANIA

CastleVania is the latest example of a Konami conversion from an arcade game to a hit for the home computer. This game is very easy to learn, but at times its challenge has made me ready to smash my joystick.



In *CastleVania*, you are a relentless adventurer trying to destroy the evil Count Dracula in his castle. In order to reach the Count, you must make your way through six progressively more difficult levels of his castle. Along the way, you fight bats, skeletons, zombies, ghosts, hunchbacks, eagles, and mummies. There are a lot of other creatures in the game, plus a supermonster waiting for you at the end of each level. More than anything, the monsters lend the game its ghoulish fun. I like games that have a lot of different monsters; they break the monotony of trudging through level after level. *CastleVania* is far from monotonous.

You view *CastleVania* from a third-person perspective, moving your character up and down steps and over obstacles. Joystick response is very good, but some levels require the utmost concentration and control that even this game expert found nerve-racking. I finally gave up on stage 10 to write this review, but I'm going back to beat it later. That's the appeal of *CastleVania*; it does warrant replay.

One part of a game that often goes overlooked is the manual. *CastleVania*'s manual is humorous and contains a lot of helpful information. The most important part of the manual is its list of objects that you'll find in the game and a description of how to use them. Kudos to Konami for this.

CastleVania's graphics are a little on the fuzzy side. That doesn't affect gameplay in any way, though. The music is riveting, and sound effects are good. Sometimes I turn off the sound to prevent it from making me any more tense. Overall, I find *CastleVania* to be a fun and challenging game. It adds another winner to the solid track record for Konami in the home computer game market.

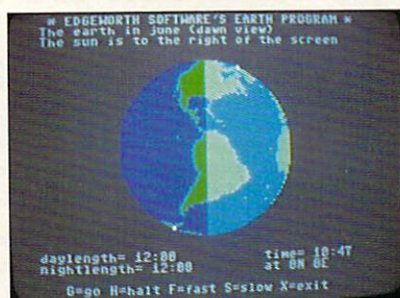
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EARTH DISK ONE

When I first got this disk, I thought it was going to be just another educational program like the ones I've used in school. I expected it to be really boring. Was I surprised to find a geography program that was this much fun!



I like *Earth Disk One* because it makes learning geography fun. It does this by showing you a 3-D, spinning

globe with nice graphics. I also like *Earth Disk One* because it's easy to use—it took me only about three minutes to learn how to use it.

After I loaded *Earth Disk One*, a menu appeared on the screen. The menu is very well written and easy to use. There are detailed instructions on how to use the program's five different modes. After reading all of the directions, I chose to go to the control screen.

From the control screen, you can choose to look at the Earth during each of its four seasons. You can also look at the Earth from seven different views: dawn, dusk, day, night, north, south, and plain view. And you can choose to see latitude and longitude lines, as well as the poles.

Next, I decided to see some of the graphics. *Earth Disk One* has the best graphics I've ever seen on any geography program. I certainly wasn't expecting a 3-D globe that actually spins on its axis. A feature of the graphics mode lets you see the length of days

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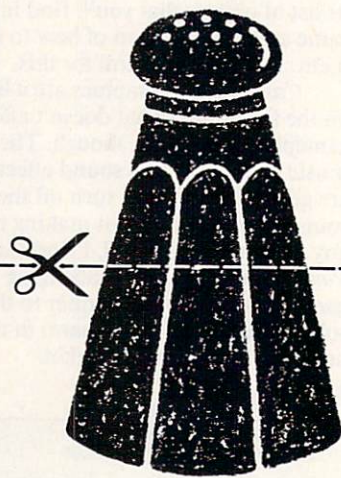
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and nights for different latitudes and longitudes. Another option lets you change the colors, which is entertaining but not important.

After looking at the graphics, I decided to check out the quiz mode. It lets you select from seven quizzes, with four questions in each quiz. One frustrating thing about the quiz mode is that you can't tell which questions you got right and which ones you got wrong—you're given your score, but regrettably, you aren't told the correct answers.

The information mode gives you facts about the physical features of the Earth. Unfortunately, you have to know a lot about geography to understand the information; plus, it doesn't help you much with the quizzes. In fact, the program suggests using an atlas to find most of the answers to the questions in the quizzes.

Edgeworth Software put a lot of effort into creating this game. Of all the educational games I've played, which is quite a few, this one is the best. It helps you learn geography while having fun at the same time. This is the first educational program I've ever really liked. I recommend *Earth Disk One* to anyone who is studying geography or who just wants

to have fun and learn something at the same time.

DOUGLAS BOLE

Commodore 64 or 128—\$19.95

EDGEWORTH SOFTWARE

44 Bower St.
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BILL AND TED'S EXCELLENT ADVENTURE

In a most bodacious and ultracool move, Capstone Software has brought to computer-gaming dudes everywhere a most excellent way to travel through time with *Bill and Ted's Excellent Adventure*. This arcade/action adventure is loosely based on the popular movie of the same name.

Bill S. Preston, Esquire, and Ted (Theodore) Logan are truly righteous high school dudes who find themselves in the most heinous predicament of failing history class. Their

limited knowledge of historical facts and figures prompts them to reply to comprehensive essay questions with answers such as, "Napoleon is a short, dead dude!" To reverse their sliding grade average and avoid the impending doom that will surely follow failure, Bill and Ted must earn a "most triumphant" A+ on their final oral exam.

At the neighborhood Circle K, our heroes meet Rufus, a messenger from the future who shows them how to use a modified telephone booth for time travel. Their mission (and yours) is to travel through time and space to locate historical dudes and bring them back for the final exam.

Using the game's small, yellow telephone book, *Circuits of Time Directory*, you input a year to travel to different periods in world history. Depending on the level of difficulty, you help Bill and Ted bag the necessary number of historical dudes (and dudettes) to pass history class. Some of the famous dudes follow you back to the phone booth as soon as you locate them. Others you must coax into coming back by offering them something they want or need. You'll find these useful items scattered throughout time, so it's a good idea to collect

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interesting stuff when you come across it. For example, Joan of Arc (Miss of Arc to you) is tied to a burning stake when you find her in the year 1429. If you have the forethought to collect a fire extinguisher, you can save her and perhaps your grade.

Traveling to 410 B.C. gives you the opportunity to bag the noted philosopher Socrates—providing you can answer the question the old Greek dude poses. Helping Billy the Kid in a saloon fight in 1878 will convince him you're his friend, as will rescuing Marie Antoinette from a maze in a palace dungeon in 1793.

Only two historical dudes at a time can travel with you to the present, so it will be necessary to make several trips back to home base at the San Dimas Mall. Once the appropriate quota of famous dead dudes has been assembled, Ted's young and curvaceous Mom, Missie, will pick everyone up and provide a ride to school.

Al Einstein said time is relative.

This is true even when speeding through the circuits of time in a telephone booth. The sooner the historical dudes are collected and presented at school, the better the grade you receive. This can be made totally not easy by selecting the most difficult of the four levels of play.

Touted as an arcade/action ad-



venture, *Bill and Ted's Excellent Adventure* leans more toward arcade fun than mind-boggling adventure. My ten-year-old dude had little trouble

zapping himself through history.

Although the graphics pictured on the box look awesome (obviously IBM format), the programmers could've paid more attention to the graphics in the 64 version. A much better effort is exhibited with the sound—as the music and speech are totally way cool.

STEVE HEDRICK

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REVIEWS

CHECKBOOK

Everyone uses a checkbook, right? Well, nearly everyone. At least we all know what one is used for. It's a convenient way to pay bills without having to carry a lot of cash.

You write checks to pay bills, record what you spend, deposit funds in the bank to cover the checks, and then hope that your figures balance with the bank statement when it arrives every month.

When your bank statement arrives, you must note service charges, earned interest (if your account is one that earns it), and interest charges on deposits made to your account by the bank (if you have an account with overdraft protection). At the end of the tax year, you start looking for records of payment for different expenses—that's when a well-maintained checkbook is a necessity.

Checkbook, from Computer Craftware, takes care of all of those details and more. Its manual gives clear instructions on how to set up a checking account and make good use of the features available. You enter the amount and the payee, whom you can indicate using a two-letter code. That gives you AA to ZZ—plenty of room for all categories.

To act as a reminder, a list of checks that you should write every month is available with one keystroke. Automatic payments are entered on the date you specify. When you receive your monthly bank statement, you mark those checks that have cleared, and *Checkbook* does the rest. Detailed lists showing those checks issued to different payees are available anytime.

The program uses Commodore commands for easy editing. Cursor keys allow full-screen editing. The bottom screen line tells you what you can do next. Menus give you all the options, and a simple two-key combination makes it easy to make selections. A utility menu offers everything from formatting a disk to changing the colors on the screen. A simple printer menu covers everything to make the program compatible with your printer.

And if you do write a great number of checks and would like the program to print those, that option is

available. The 128 version makes use of the 80-column screen. You'll need a separate disk for each *Checkbook* file if you're using a 1541 or 1571, but instructions are given for using the 1581 with partitions.

The program even shows a highlighted colored bar to alert you to the fact that you'll be overdrawn if you process a current check. It seems as though Computer Craftware has covered everything except how I can deposit more money into my account.

ESTHER OLSON

Commodore 64 or 128—\$34.95

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GHOSTBUSTERS II

Although the computer version of *Ghostbusters II* may disappoint admirers of the original, many will feel that the current offering provides more varied gameplay than did its predecessor.

For one thing, the game takes place in three different settings. In your first mission, you must descend into the Van Horne transit tunnel via cable, make it to the bottom alive, assemble a slime scooper by collecting the necessary pieces, and scoop up a gooey sample. You'll need the slime later to defeat the bloodthirsty Vigo.

Complicating matters are strength-sapping ghosts and falling rocks. Watch out for spirits who will saw away at your cable until it breaks, hurling you to your death. Defensive options include dodging and using a shield. Firing proton beams and setting off PKR bombs are your offensive choices.

You'll find this segment difficult at first for several reasons: sloppy joystick response, particularly when trying to collect objects; the awkwardness of using the joystick and keyboard simultaneously; and the failure of the manual to explain how to scoop up slime. After you've mastered this level, you'll wish there were a way to bypass it so that you could proceed immediately to greater challenges.

On Broadway, you control both the Statue of Liberty (by joystick) and

your team of Ghostbusters (by keyboard). Your destination is the Museum of Art, where you'll confront Vigo. To arrive safely, you (as Miss Liberty) must travel through a horizontally scrolling screen, shooting fireballs from your torch at endless waves of ghoulish attackers. At the same time, as the Ghostbusters, you have to run out and mop up the remains of your assailants to help replenish Miss Liberty's strength.

Making it through will be a lot easier for two players working together. For a single player, handling both Miss Liberty and the Ghostbusters will be quite a chore.

In the museum, all four of the Ghostbusters have to climb down a rope to the gallery without falling off. Then they must choose appropriate weapons, activate various Ghostbusters, rescue a kidnapped baby from Vigo's clutches, dispatch all humans under Vigo's control, and defeat the evil genius by trapping him in cross fire.

Success requires almost superhuman manipulation of the joystick, space bar, and Return key. Adding to the difficulty are the hazy graphics—the weakest in the game—and the sheer volume of chores to be performed. A more reasonable approach would've been to add a fourth scenario featuring some of the museum's challenges.

Owners of 64s expecting the Amiga-style digitized graphics displayed on *GBII*'s packaging will be disappointed. Nevertheless, most of the artwork is attractive and clear, and the animation is graceful.

Extremely annoying are the lengthy reboots required after you've been killed. This is particularly frustrating in the museum segment, where an early demise is the natural state of affairs.

Still, *Ghostbusters II* is mildly diverting entertainment. While it isn't worth writing home about, it doesn't deserve to be completely written off, either.

LEN POGGIALI

Commodore 64 or 128—\$29.95

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FEEDBACK

QUESTIONS FROM OUR READERS

Down Periscope

I am writing to let you know that *Periscope* and *Periscope II* are trademarks owned by the Periscope Company. These products are debuggers for use in programming the IBM PC. *COMPUTE* and *COMPUTE!'s Gazette* have published programs of the same name. Our attorney has advised us that we must ask you to change the name of your programs in order to protect our ownership of the trademark.

SHARON BAILEY, VICE PRESIDENT
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We are more than happy to comply with your request. Since our similarly named programs are disk-sector editors, we'll change the name to SectEd. We regret any inconvenience or confusion that may have resulted from the inadvertent duplication of program names.

Bug-Swatter

SectEd 64, formerly known as *Periscope II* (February 1991), has two typos in the listing that create syntax errors during sector edits. Lines 420 and 450 each begin with *IF INCOS*. The *COS* should be replaced by an equal sign, making each line begin *IFIN=*.

Line 690 of Pharaoh's Revenge (November 1990) is too long to enter as printed. Here's the correct listing.

```
QP 690 PRINTSPC(N){RVS}{5}E"
;:FORJ=0TOKI/2:PRINT"
{RVS}{T}";NEXT
```

Under the Menu

Many programs for the 128 use pop-up menus. After a menu disappears, the information that was underneath it returns to the screen. I've tried listing the programs to see how they do it, but all of these programs are written in machine language. Could you tell me how they do this using BASIC and maybe include a short demonstration program?

H. H. FELTY JR.
WINSTON-SALEM, NC

Pop-up menus don't actually cover underlying text. Instead, the program saves the part of the screen that will be affected before the menu pops up. The saved portion of the screen is then restored when it's time to exit the menu.

For a program to help you create windows to your own programs, check out Window Wizard (September 1986). If you don't have access to that issue, try the following BASIC code. It writes a screenful of text, saves the region where the window will go, draws the window, and then restores the screen after a key has been pressed. Line 10 dimensions arrays for holding the screen characters and colors. Line 30 uses the subroutine at lines 160-200 to print the main screen. Lines 40-70 read the screen data from where the window will be and color data for that region from color memory. The window data is written in a different color at line 90. Line 100 waits for a keypress. And lines 110-140 restore the original screen data and color.

```
JR 10 DIM DD(13,20):DIM CL(13,
20):POKE 53280,0:POKE 53
281,0
KS 20 AS="COMPUTE ":PRINT CHR$(
147);CHR$(150)
BB 30 WW=39:FOR X=1 TO 23:GOSU
B 160:NEXT
QH 40 FOR X=1 TO 13:FOR Y=1 TO
20
DM 50 DD(X,Y)=PEEK(1023+Y+X*40
)
MF 60 CL(X,Y)=PEEK(55295+Y+X*4
0)
XH 70 NEXT Y,X
BD 80 AS="WINDOW DATA ":PRINT
{SPACE}CHR$(19);CHR$(154
)
FA 90 WW=20:FOR X=1 TO 13:GOSU
B 160:NEXT
QF 100 GET AS:IF AS="" THEN 10
0
ES 110 FOR X=1 TO 13:FOR Y=1 T
O 20
FD 120 POKE 1023+Y+X*40,DD(X,Y
)
FR 130 POKE 55295+Y+X*40,CL(X,
Y)
GH 140 NEXT Y,X
GX 150 END
HR 160 Y=INT((X/LEN(AS))-INT(X/
LEN(AS)))*LEN(AS)+.5)+1
:CS=AS
```

```
QS 170 IF Y>1 THEN BS=MID$(AS,
Y):CS=BS+LEFT$(AS,Y-1)
SE 180 FOR Z=1 TO 3:CS=CS+CS:N
EXT
DE 190 PRINT LEFT$(CS,WW)
MC 200 RETURN
```

Custom Characters

I'm interested in customizing the character set of my 64C, but I don't have any idea where the memory locations for the characters are. Could you tell me the location for the character and graphic sets and how my computer determines the location?

HUBERT CHAN
ST. ALBERT, AB
CANADA

The 64C (which, for programming purposes, is simply a 64 with a new case) has its character set at address 53248 (\$D000). This is a read only memory (ROM) location. An interesting thing about 64 ROM areas (including BASIC and Kernal ROM) is that numbers poked there are stored in the underlying RAM, but when you peek the same location, only the ROM value is read.

To define your own character set, you'll need to tell the video chip to look at a non-ROM area so that it will "see" the characters that you define. To modify the 64's character set, copy the old character set to the new location in RAM and work with it there. While transferring, remember that the native character set is 512 characters long: two contiguous 256-character groups for the two text modes produced with the Shift and Commodore keys. Each character is 8 bytes in size. The entire character set, then, is 8 X 512, or 4096 (4K) bytes long. A full transfer, with the RAM address symbolized by RAMADR, will look something like this in BASIC:

```
FOR X=0 TO 4095:POKE
RAMADR+X,PEEK(53248+X)
:NEXT
```

How do you determine what RAM address to use? There are several possibilities here, but they depend on some additional factors. First, the VIC-II



FEEDBACK

video chip can "see" only 16K of memory at a time. For this reason, the 64's memory is divided up into video banks numbered 0 through 3. It's not advisable to use banks 0 and 3 for experimenting with video information from BASIC because they're located at the system-RAM/low-BASIC-program and ROM areas, respectively (although bank 0 is the default setting).

Of those remaining, bank 1 extends from address 16384 (\$4000) to 32767 (\$7FFF); bank 2, from 32768 (\$8000) to 49151 (\$BFFF). Only bank 1 is completely available for BASIC programmers, though some caution must be taken not to overwrite video information with the program or variables. A machine language program is required to get at all of bank 2.

To make the VIC look where you want, set bits 0 and 1 of address 56576 (\$DD00) to the desired bank number (bits 0-3 are represented in two-bit binary form as 00, 01, 10, and 11). Also, bits 0 and 1 of address 56578 (\$DD02) must both be set, no matter which bank you choose. If the bank number is symbolized by BANK, a BASIC line for changing the video bank looks like this:

POKE 56576,(PEEK(56576) AND 252) OR BANK:POKE 56578, PEEK(56578) OR 3

Once the bank has been chosen, your custom character set needs a suitable location within the bank. It must be suitable because the character set will be vying for space with text-screen RAM and/or a bitmap (if you choose to use one).

The text screen takes up 1K of memory locatable at any of the 16 possible addresses within the video bank which are evenly divisible by 1024. Another way of putting this is that the possible locations for the screen are some multiple of 1024 added to the starting address of the video bank you've chosen. Store that multiple, as a value from 0 to 15, in the upper four bits of address 53272 (\$D018). With the multiple symbolized by N, a BASIC line for doing this is

POKE 53272,(PEEK(53272) AND 15) + 16*N

The VIC is told where to look for the character set in much the same way.

Here, the bank offset is in multiples of 2K—full 2048 bytes—in recognition of the fact that most custom character sets will have only one mode. Because there are eight 2K boundary addresses, only three bits are needed to specify which one to use. They are bits 1, 2, and 3 of the same register that signals where the screen is. If N is the needed 2K multiple, select the character location from BASIC by using the following line.

POKE 53272,(PEEK(53272) AND 241) + 2*N

Proofreader Error

When loading *The Automatic Proofreader* in 128 mode, I get a syntax error in line 30. I'm sure the program has been entered correctly. Can you help?

HANS SPARREBOOM
TOFIELD, AB
CANADA

Several of these incorrect listings were printed and given to our art department before we noticed the error. We thought they were all replaced with corrected versions, but occasionally one still turns up. In line 30 of *The Automatic Proofreader*, replace the word WAIT with GRAPHIC, and it should work.

As you may have noticed, we don't always print *The Automatic Proofreader* and MLX in every issue as we once did. By omitting these, we have more space for program listings. Since these two programs make it much easier to type in our BASIC and machine language programs, we strongly recommend their use. If any new subscribers don't have a copy of these programs, send us a self-addressed, stamped envelope, and we'll see that you get both listings.

Wrong Info

In the March issue, Rich Mauney asked about getting a program on the June 1990 Gazette Disk. According to my user group, the June Gazette Disk is not, and never was, available. Could you please clear up this question?

ROBERT L. CLARK
PASO ROBLES, CA

We don't know where your user group got that idea. The June issue was the last COMPUTE!'s Gazette in its old

format, and it had a companion disk just as any other issue. If you were—or your group was—a disk subscriber at that time, you should have received the disk. If you didn't, contact our Greensboro office. That disk and other back issues are available for \$9.95, plus \$2.00 shipping and handling. We did not publish in July, August, or September, but we were back in business with the October issue.

Dictionary Cruncher

At one time a reader wrote asking how commercial spelling checkers can have 80,000 words or more in them. The answer had something to do with the coding scheme. Where did I read that? I'm thinking about a similar technique for a RAM-based dictionary for a program I'm working on.

DALE G. HALBACH
COSTA MESA, CA

The "Feedback" letter you referred to was in the January 1989 issue of COMPUTE!'s Gazette. (We located it using the Gazette Index disk.) It concerned the word storage format of the SpeedCheck dictionary. SpeedCheck uses two special tricks to save disk space. The first is to leave off the starting letter of the word, since all words in a particular alphabetical group begin with the same letter anyway. The second trick separates words by setting the high bit of the last byte (character) of each. Because text characters don't use the high bit, no information is lost, and a byte of storage that would have otherwise been expended on a separator character is saved.

Form Maker

My 128 does almost everything I need a computer to do. It keeps my finances organized, prints my posters, does my correspondence, and helps educate my children. In spite of all this, there's one thing I see PCs and Macs doing that I cannot. Is there a program that will help me make forms?

ELROY GANDY
GARNISH, NF
CANADA

Check out Business Form Shop (\$39.95) from Brøderbund (17 Paul Drive, San Rafael, California 94903). It generates and prints invoices, expense account records, financial statements, and various reports. □

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D'IVERSIONS

F R E D D ' I G N A Z I O

Who makes me write this column every month? I used to blame my editor, Tom Netsel, for forcing me to sit down at the computer each month and write this page. I had this problem, however, before he became my boss at Gazette.

I used to blame other magazine editors for shackling me to the computer while I wrote columns and articles for them. Maybe they weren't totally to blame.

I used to blame my boss at work for grafting me to the computer for all-night, nonstop programming marathons. For a while I thought he was the heavy, but no longer.

Now I know who's really to blame. Now I know who forces me to spend so much time hunched over a keyboard, squinting at a monitor. Now I know who the real culprit is.

My computer!

I used to believe that computers were labor-saving devices. Computers, after all, were just the latest descendant in a long line of household and office appliances, including vacuum cleaners, refrigerators, copying machines, and microwave ovens. Computers, like other machines, were supposed to make our lives simpler and free us from backbreaking toil.

Now I realize that this is just a myth. The culprit behind this myth is the word *automation*. Computers were supposed to automate work. We were to become the masters, and computers our slaves. We would tell the computer what needed to be done, and the computer would do it. We could sit back and relax while all this work was being performed for us.

Somehow, this master-slave thing got mixed up. Instead of the computer's being the slave, it somehow started acting like the master. Instead of my being the master, I somehow ended up as its slave.

Remember when you started a computer using the BASIC language and when the computer was up and running, it would come back and say, "READY"? That was neat, wasn't it?

Did you ever think how ironic that sweet, innocent little word really is?

The computer is *always* ready. If you leave your computer on (as I admit I do), it is ready 24 hours a day! I sit down at my computer. It's ready. I pass by the computer on the way to the kitchen. It's ready. I'm in the bathroom brushing my teeth. The computer is ready. I'm tossing and turning in my bed at two in the morning. The computer is still ready!

Over time the thought that the computer is ready has imprinted itself deeply into my subconscious. I may be a lazybones and want to sit down to dinner with my family, but the

rinse the computer from my brain and go about living the rest of my life? Heck, no. I'm a wimp! I hear it calling me, and I have to answer.

"Well, OK," I say as I slip sideways into the computer's room. "I'll just type a few lines. Then I'll get up and go do the other things I'm supposed to be doing."

The computer cursor seems to blink with a brighter, perkier beat. Four hours later, where am I? Still sitting at the keyboard, typing just one more line. Still entering more data. Still drawing just one more graphics screen. Still playing just one more round of *Tetris*, *Mario*, or *Computer Solitaire*.

Usually, I can get away with spending so much time with my computer, but not always.

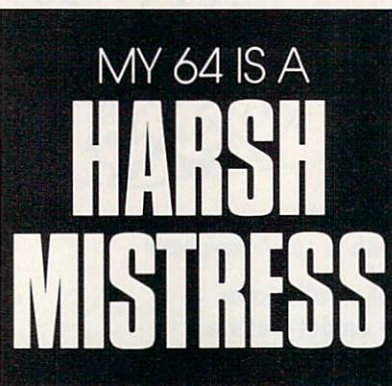
One night I was working on just one more line in a program that was already 26 feet long (I measured the printout). My wife had been hinting all night that she was going to bed soon. She had hinted that it would be nice if I joined her.

Did I pick up on these hints? Huh-uh, and I paid. I really paid. About two in the morning, my poor wife no longer felt in a romantic mood. Insulted, ignored, and just plain mad, she stormed out of the bedroom, down the stairs, and into the kitchen where I was working on the computer.

She threw a pillow at me, which bonked me on the nose. She heaved a big yellow blanket at me, which floated down over my head. "Go ahead!" she cried. "Stay all night with your electronic mistress! See if I care!" She stormed out crying.

As I sat there in the kitchen in a state of shock with the blanket over my head, I began thinking that maybe my wife was right. Maybe she had hit the mark in more ways than one.

To all you fellow wimps out there, be very careful. Your computer mistress (or the male equivalent) can demand so much of your time that there is little time for other things in life. Like your spouse. □



computer is ready. I may want to sack out on the couch and watch a little TV, but the computer is ready. I may want to go ride my bike, catch a movie, or browse in a bookstore, but you-know-who is still ready!

The worst part is that I know it!

It's like the computer has this tiny voice that sings a siren song to me at all hours of the night and day. "I'm ready, Freddie!" it croons softly and sweetly with its little cursor rhythmically tapping its foot on the screen. "I'm here. I'm yours. I'm ready to work, play, do anything I'm capable of doing. All you have to do is sit down and type."

So, big bohunk kind of guy that I am, what do I do? Do I turn my back on the computer and walk away? Do I



MACHINE LANGUAGE

J I M B U T T E R F I E L D

There's a tiny (nonsymbolic) assembler built into most machine language monitors, such as *Supermon*. It allows you to type in mnemonic commands, and it changes them to machine code. For example, if you type A 033C LDA #04, this instruction will change to A9 04, and the monitor will prompt you with A 033E so you won't need to calculate the address.

That's fine for small programs and for experiments. As you write bigger programs, however, you'll want to buy a full-scale, commercial symbolic assembler. It will make quite a difference in the way you develop programs.

Most people describe full assemblers in terms of mechanical features. In other words, they say how the use of symbols simplifies calculation and speeds program writing. I'll talk about some of these features in a moment, but there's a more important aspect.

With a symbolic assembler, you can save your source code. That's incredibly useful. It means you can go back and adjust your program, adding a bit here, trimming there.

That way, you can easily go through a full development cycle. Write it, test it, and then go back and adjust it as needed. You can start by putting in test-coding that will help you debug. When your program looks good, out goes that extra code.

Over the longer term, you can return to old programs and trim them up for new requirements or new machines. When you do, you'll be grateful for the comment lines that you wrote; they'll help you remember what you had in mind at the time of the original coding.

Symbols help by automatically working out addresses within your program and allowing system calls and hardware registers to be referenced by name rather than by address.

As you write a program, you might want to branch ahead to as-yet-unwritten code. No problem. Give that code a symbolic name. The assembler will expect you to supply code with such a name. If you don't, it

will remind you with an undefined symbol message.

Want to figure out the length of a text string? For example, you might have coded a message as a group of bytes. Instead of counting the length of this message, you can have the assembler do it, this way:

```
MESSAGE .byte "GOOD-BYE,
          CRUEL WORLD!",$0A
MLEN = *-MESSAGE
```

**PUTTING
IT ALL
TOGETHER**
ASSEMBLING
THE PERFECT
ASSEMBLER

The asterisk means, roughly, "here," so that the phrase *-MESSAGE subtracts the address beyond the end of the string from the address of the string's start. Result: the length of the string. If you ever change the string, the length will be recalculated automatically.

You might use symbols to code SID=\$D400 or SID EQU \$D400. After such a definition, you would be able to write STA SID+\$18 rather than STA \$D418. Some programmers find it hard to remember that the SID chip is at memory location \$D400 and find the symbolic address is a help. Similarly, they might prefer JSR

CHROUT rather than JSR \$FFD2.

Comments help you remember what a particular piece of code is intended to do. They can help you spot code as you scan a large listing. Comments are also useful for long-term program maintenance. Weeks or months after your original program is written, you may want to go back to the source. Perhaps you want to revise the program, or perhaps you want to use some of the code in another project. Either way, the comments will remind you of the way the job is organized.

Comments are also useful to help other people read your code. Sometimes they draw attention to interesting coding tricks that might otherwise be missed.

Many assemblers have extra features that are useful for advanced coding. Macros permit canned code to be invoked, often customized for the particular application. A similar feature is the include command, which allows prewritten code to be called into your current project. Conditional assembly allows you to produce several versions of the same program from a single source. For example, you might have a program that assembles two separate versions for the 64 and 128. Some assembler systems come in two pieces: an editor that allows you to write and update source code and an assembler that converts it into the final object program. Others are integrated into a single operating system. There are a couple of assemblers that cleverly use the built-in BASIC editor of Commodore 8-bit machines.

Assembler program packages seem to have erratic availability: in stock, out of production, repackaged, and then extinct. The problem may be that dealers find that such packages don't have a steady market. *Commodore Development Package*, for example, seems to appear and disappear periodically.

If you know other programmers who are using a specific assembler, try to get that one to make it easier to exchange ideas and coding. □



BEGINNER BASIC

L A R R Y C O T T O N

BASIC math on the 64 can range from the extremely simple to the complex. Let's begin a series that explores that range, beginning with the former and working toward the latter. You'll be amazed at how quick and versatile this computer is in solving math problems. All math operations can be performed in either program or immediate mode (with or without line numbers). The four basic math operations are addition (+), subtraction (-), multiplication (*), and division (/). Let's illustrate all four:

```
10 INPUT "FIRST NUMBER";A
20 PRINT:INPUT "SECOND
NUMBER";B
30 C=A+B
40 PRINT:PRINTA+"B"="C"
```

This is the classic way of gathering user input and then performing math operations on it. In the following examples, little or no error checking is provided, so enter logical numbers. Note that the + and = signs are the entities between quotes, not the variables A, B, and C. Therefore, the + and = signs are printed literally, while the variables' values get printed. Here's the same program for subtraction with positive answers:

```
10 INPUT "LARGER NUMBER";A
20 PRINT:INPUT "SMALLER
NUMBER";B
30 IF A=<B THEN PRINT CHR$(147):
RUN
40 C=A-B
50 PRINT:PRINTA+"B"="C"
```

This is similar to the first example, with a check at line 30 to ensure positive answers. Here's an example with multiplication and division in one problem:

```
10 INPUT "FIRST NUMBER";A
20 PRINT:INPUT "SECOND
NUMBER";B
30 C=A*B:D=A/B
40 PRINT:PRINTA+"B"="C
50 PRINT:PRINTA+"/"+B"="D"
```

The above problems can be abbreviated slightly by eliminating one variable and by combining the math and printing operations. Here's how line 30 of the first example could look:

```
30 PRINT:PRINTA+"B"="A+B"
```

**BASIC
MATH**
YOU CAN
DO MORE THAN
COUNT ON IT

Incidentally, addition, subtraction, and division are usually expressed literally and mathematically the same way, as +, -, and /, respectively. Multiplication, however, can be expressed literally as capital X, but the math operator must be the asterisk (*).

Using division, fractions can easily be converted to decimals:

```
10 INPUT "NUMERATOR";N
20 PRINT:INPUT "DIVISOR";D
30 A=N/D
40 PRINT:PRINT "DECIMAL
EQUIVALENT IS" A
```

The BASIC function that instantly takes the square root of a number before you can release your finger from the RETURN key is SQR(.). Here's an easy one for the computer:

```
10 INPUT "NUMBER TO TAKE
SQUARE ROOT OF";N
20 S=SQR(N)
```

```
30 PRINT:PRINT "SQUARE ROOT
OF" N="S"
```

Use the up arrow for exponents:

```
10 INPUT "NUMBER TO SQUARE";N
20 S=N^2
30 PRINT:PRINT "SQUARE
OF" N="S"
```

Here's a method for determining any root of a number:

```
10 INPUT "NUMBER TO TAKE A
ROOT OF";N
20 PRINT:INPUT "WHICH ROOT";R
30 A=N^(1/R)
40 PRINT:PRINT "ROOT OF" N "IS" A
```

Try this by entering 64 and 3 at the prompts; this will yield 4 as the cube (third) root of 64.

Let's use a variant of the above programs in a practical example to calculate how many cubic yards of concrete you'd need for a driveway:

```
10 INPUT "DRIVEWAY LENGTH IN
FEET";L
20 PRINT:INPUT "DRIVEWAY
WIDTH IN FEET";W
30 PRINT:INPUT "CONCRETE
THICKNESS IN INCHES";T
40 T=T/12:REM CONVERT INCHES
TO FEET
50 CF=L*W*T:CY=CF/27
60 PRINT:PRINT "YOU NEED" CF
"CUBIC FEET"
70 PRINT:PRINT "OR" CY "CUBIC
YARDS OF CONCRETE."
```

Notice the illegal algebraic, but perfectly legal BASIC, operation in line 40. T's first value is input as inches and then converted to feet by dividing by 12 (12 inches per foot). It's OK to change T's value like that as long as you won't ever need the first value of T again in the program. Line 50 multiplies all the feet together to arrive at cubic feet and then converts cubic feet to cubic yards by dividing by 27 (27 cubic feet per cubic yard). To calculate only cubic yards, we could use only one variable, say, C:

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50 C=L*W*T:C=C/27

60 PRINT:PRINT"YOU NEED"C

"CUBIC YARDS OF CONCRETE."

Again, $C=C/27$ makes no algebraic sense, but it's legal in BASIC. I like to minimize the number of variables used in a program, although this practice does make a program somewhat more difficult for you (or anybody else) to understand later.

Math performed with computers is the same math done with calculators, or, for that matter, with pencil and paper. Certain conventions have been adopted which are universal. For instance, in most problems, the math operations are performed from left to right. Keeping that in mind, what's the answer to this problem?

$12+6-3$

The answer is 15. And 15 would be the answer also if the numbers were rearranged:

$-3+6+12$

Adding and subtracting are commutative; that is, they can be done in any order. Just be sure that the signs stay with the numbers. Multiplication

and division are trickier:

$12/6*3$

The answer is 6 because in problems which contain only these two operations, the computer will tackle the math from left to right. How about this one, where operations are mixed?

$4+6/2*3$

Is it 21? 15? 5? 13? The correct answer is 13, because mixed mathematical operations are traditionally performed in this order: multiplication and division first (left to right), then addition and subtraction. The first letters form the memory aid *My Dear Aunt Sally*. In the problem above, 6 is divided by 2 to get 3; 3 is then multiplied by 3 to get 9; then 9 is added to 4 to get 13. Don't take *My Dear Aunt Sally* too literally—multiplication doesn't take precedence over division, nor does addition take precedence over subtraction. But both multiplication and division do take precedence over either addition or subtraction. Going further, what's the answer to this problem?

$(3+4)*(5+6)$

Did you guess 29? No, the answer is 77. To cause the computer to preempt *My Dear Aunt Sally* requires extra effort. Any operations within parentheses take precedence over *My Dear Aunt Sally*. Thus, 3 must be added to 4 to get 7; then 5 is added to 6 to get 11; then 7 and 11 are multiplied to get 77.

Here's a final test. What's the answer to this problem?

$15+3/12*4+6*(4+5)$

This example introduces exponents, which take precedence over other operations. The easiest way to solve it is to enter it with the word PRINT in front and then press RETURN.

That's math in the immediate mode. But before you do that, try to predict an approximate answer.

Although we studied this not long ago, we'll continue our BASIC math series next month with a review of the somewhat arcane, but nevertheless quite useful, trigonometric functions.

Thanks to calculators and computers, trig functions are now a mere keypress away. They're also more accurate than those interpolated from trigonometric tables or calculated with the help of a slide rule. □



PROGRAMMER'S PAGE

R A N D Y T H O M P S O N

Try this the next time you save a program to disk. Immediately after you enter a filename in a SAVE command but before you enter the closing quotation mark, hold down the Shift key and press the space bar, hold down the Commodore key and type DUDE, hold down the Shift key and press @, and then type the terminating ",8 and press Return. When you list the disk directory, the computer will show the filename with a .8,1 extension. Now, all you have to do to load and run the program is move the cursor to the first column of the line containing the filename and press Shift-Run/Stop.

STACY OLIVAS
GRAHAM, WA

Instant Disk Status

Type in and run the following program to gain instant access to your 64's disk drive's error status.

```
KE 10 DV=8:SA=49152
MG 20 FOR I=SA TO SA+43:READ D
:POKE I,D:C=C+D:NEXT:POK
E SA+9,DV
KD 30 IF C<>6193 THEN PRINT "E
RROR IN DATA STATEMENTS"
:END
KC 40 PRINT "TO CHECK DISK STA
TUS, ENTER SYS";SA
EE 49152 DATA 169,0,32,189,255
,169
KA 49158 DATA 15,168,162,8,32,
186
MX 49164 DATA 255,32,192,255,1
62,15
EE 49170 DATA 32,198,255,32,20
7,255
FM 49176 DATA 32,210,255,201,1
3,208
CQ 49182 DATA 246,169,15,32,19
5,255
SR 49188 DATA 32,204,255,169,0
,133
XQ 49194 DATA 198,96
```

The next time your disk drive light flashes rudely in your face, type SYS 49152 and hit Return. After consulting with your disk drive, this program echoes the cause of the drive's irritation to the screen.

As presented above, this program returns the error status of the disk drive known as device 8. To modify the program to check a different device, change line 10 so that the vari-

able DV is set equal to another number—such as 9 for device 9—and run the program again. You can also enter the command POKE 49161,x after running the program above, where x is the desired device number.

This program stores its error-detecting machine language routine in memory starting at 49152. You can

MORE TIPS FROM READERS: STUPID DOS TRICKS

change this starting address by changing the value assigned to SA in line 10. If you change the starting address, you must also change the SYS instruction to reflect the routine's new location.

FRANCISCO FELIX
LA PAZ, BAJA CALIFORNIA SUR
MEXICO

Color-Coded Directories

Make your directories more colorful by using the following two commands to format your disks:

```
OPEN15,8,15,"N0:"+CHR$(141)+
CHR$(x)+"name,id"
CLOSE 15
```

Name is a disk name comprised of 16 or fewer characters, id is any two-character disk identification, and x is one of the following color values:

Value	Color	Value	Color
5	white	151	gray 1
28	red	152	gray 2
30	green	153	light green
31	blue	154	light blue
129	orange	155	gray 3
144	black	156	purple
149	brown	158	yellow
150	light red	159	cyan

The directory of the newly formatted disk will list to the screen in the color that you have selected.

MATT L. GATSKIE
AKRON, OH

Two-Line BSAVE

This short BSAVE routine allows 64 owners to save any area of the 64's memory to disk. You can save machine language programs, custom ROM routines, and graphics data.

To use this two-line BSAVE, make F\$ equal to the desired filename, DV equal to the drive's device number (usually 8), SA equal to the starting address, and EA equal to the ending address plus one; then GO-SUB 1000. Alternatively, you could insert this code anywhere you use it, eliminating the need for the RETURN in the last line.

```
JX 1000 SYS 57812 F$,DV:POKE 1
73,SA/256:POKE 172,SA-
PEEK(173)*256:POKE 780
,172
XK 1010 POKE 782,EA/256:POKE 7
81,EA-PEEK(782)*256:SY
S 65496:RETURN
```

This subroutine is actually very simple in operation. After setting the file parameters using a ROM routine located at 57812 (\$E1D4), the subroutine initializes the starting and ending addresses and calls the well-documented Kernal routine, SAVE.

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PROGRAMS

R O B E R T R O C K E F E L L E R

This powerful program turns your 64 into a sophisticated, programmable scientific calculator, with 52 functions, 100 memory registers, and a 50-item stack. Additional functions can be added through the use of BASIC programs and macros to make it even more useful.

SciCalc 64 is an RPN (Reverse Polish Notation) stack-oriented calculator, as opposed to the more common algebraic calculators. RPN is a notation invented by a Polish mathematician. To perform an operation, you first enter onto a stack the number or numbers to be operated on; then you perform the operation. For example, to multiply 5 times 3, you would type 5 and then press the Return key to place the number 5 on the top of the stack. Then type 3 * to place the number 3 on the stack and perform the multiplication. Any operation key such as * performs the function of entering a number onto the stack as well as the function assigned to the key.

Entering the Program

SciCalc 64 is written entirely in machine language, but it loads and runs like a BASIC program. To enter it, use *MLX*, our machine language entry program; see "Typing Aids" elsewhere in this section. When *MLX* prompts, respond with the following values.

Starting address: 0801

Ending address: 1AB0

When you've finished typing, be sure to save the program before exiting *MLX*.

Getting Started

After you load and run *SciCalc 64*, you may want to practice entering numbers and performing calculations with the following examples.

To compute $342 + 98765$
Type 342 Return 98765 +

To compute $(5+3)*(6+2)/3$
Type 5 Return 3 + 6 Return 2 + * 3 /

To enter a negative number, such as -6, use the back arrow.
Type 6 -

To compute $-(5.393e-5)-3.66$
Type 5.393e-5-3.66 -

To compute $\sin(3\uparrow 2/4.66)$
Type 3 Return 2 $\uparrow$ 4.66 / Ctrl I

SCICALC 64

TURN YOUR 64 INTO
A SCIENTIFIC
CALCULATOR

Let's look at some conventions regarding use of the keyboard. Some functions are called by pressing a single key, such as F, M, Return, or Del; others require you to press two keys simultaneously. For example, Shift-C means press a Shift key and the C key simultaneously. C=-B indicates that the Commodore logo key at the lower left of the keyboard is to be pressed simultaneously with the B key.

The Stack

The stack is displayed at the top left of the screen. Although the stack can contain 50 numbers, only the first ten entries are displayed. The top two stack entries are labeled X and Y on the calculator display. These are special because all calculator functions, such as multiplication, addition, sine, cosine, and so on, are performed on one or both entries. Results are also displayed in the X register.

Functions that require one operand (such as sine, cosine, compute logarithm, and square root) operate on the X register (the top stack entry) and display the answer in the X register. Functions that require two operands, such as multiplication, subtraction, and so on, operate on the Y and X registers, displaying the answer in X.

When you enter a number, you'll see a solid cursor on the rightmost character of the top stack entry, indicating input mode. During this mode you can enter the keys 0-9, the decimal point, and E to indicate exponentiation. After entering E, you may press the minus sign to indicate a negative exponent. Except for this one special case with exponents, typing a minus sign will compute a subtraction ($Y - X$), so be careful. Don't use the minus key to enter a negative number. Type the number first; then press the back-arrow (-) key to change the number's sign.

Pressing the Del key during input mode deletes the last character entered. Pressing Return during input mode terminates input mode and places the number on the stack. Pressing Del when no cursor is displayed deletes the top stack entry. Pressing Return when no cursor is displayed duplicates the top stack entry.

The Memory Registers

The memory registers are displayed at the top right. Although you can store 100 different numbers in memory, only ten are displayed at any one time. Memories 0 to 9 are displayed when the calculator is first started. The other memories can be displayed with the cursor keys. Press cursor-down to display the next lower set of memories. Press cursor-up to display the next higher set of registers.

Mode Indicators

Below the stack display are three boxes labeled *Degrees*, *Radians*, and *Gradients*. These indicate the format used for such trigonometric functions as sine, arc sine, and so on. A check mark appears beside the current format.



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Near the bottom is a box labeled Record. A check mark will appear beside this box when a macro is being recorded. Macros are explained later.

Error Handling

If an error occurs during an operation, an error message will be displayed on the bottom line of the calculator. Press the fl key to clear it.

BASIC Programs

SciCalc 64 has the ability to keep a number of BASIC programs in memory at the same time. The total number is limited only by the amount of memory available. Memory from hexadecimal address \$B000 to \$FF00 is used for program storage, which gives about 20224 bytes. You can select among programs stored there and execute them at any time.

Let's demonstrate with an example. Load and run *SciCalc 64*. When the working screen appears, press the X key to exit to the normal BASIC environment. While in this environment, you can perform any normal BASIC function, such as loading, running, or writing programs. You should not run any machine language programs, however. For our demonstration, type in the following short program and save it to disk with the name *Permutations*.

```
10 X=1: IF CS(0)=0 THEN 30
20 FOR A=1 TO CS(0): X=A*X: NEXT
30 CS(0)=X
```

Now type SYS2065 and press Return to restart the calculator. Now load *Permutations* into the calculator. Press C=-L; then type *Permutations* and hit Return at the prompt. To get a list of all BASIC programs loaded into *SciCalc 64*, press C=-B. Currently, *Permutations* is the only one.

Permutations calculates the number of different ways in which n objects may be arranged. The formal notation is $n!$. For example, the letters A, B, and C may be arranged in six different ways.

```
ABC ACB BAC BCA CAB CBA
3! = 3 * 2 * 1 = 6
```

Let's test the program. Type 3, then press the B key, and then enter *Permutations* and a Return to execute the program. The 3 is replaced by 6,

showing that the computation was performed correctly. We have added a new function to the calculator, but how does it work?

To execute a program, the calculator searches storage to verify that the program is present in the computer. If the program is not found, an error message is issued. If the program is found, it is copied to BASIC program memory. Then the stack and memory registers are passed to the BASIC program by means of two arrays which are created automatically by the calculator. Array CS(49) is created for the stack, and array CM(99) is created for the memory registers. CS(0) corresponds to the X register (the top of the stack), CS(1) corresponds to Y, and so on. CM(0) corresponds to memory register 0, CM(1) corresponds to memory register 1, and so on. Any change made to either array is reflected in the stack and/or memories when the calculator regains control.

On occasion, you may need to make use of a BASIC program that prints something to the screen and/or uses the INPUT command. Press the C key (clear screen and execute BASIC) for this purpose. The B key (execute BASIC) neither clears the screen before executing nor redraws the calculator screen after BASIC finishes executing. This is beneficial for programs like *Permutations*, since it prevents an annoying screen flash. (A summary of all *SciCalc 64* commands is printed below.)

Macros

In addition to executing and using BASIC programs, *SciCalc 64* possesses another programmable feature known as *macros*. A macro is a list of instructions or commands that the program saves and performs later, saving the user from having to enter them every time that command is used.

To demonstrate, press the R key and then ! followed by Return. Notice that a check mark appears beside the Record box, indicating that a macro is being recorded. Everything you type now will be recorded until you press R again, which terminates recording. Press B, then type *Permutations*, press Return, and then press the R key again.

We have just created a macro named !. To test this macro, press

Shift-M. At the prompt, press ! followed by Return. What was just recorded will be played back verbatim. We have created a macro that saves us from a lot of typing when using the *Permutations* program.

Macros execute commands with only a couple of keypresses. Macro names can be up to 16 letters long, but by keeping them short, macros can be executed by typing M and then typing the macro name. For example, type 9 M! to execute *Permutations* again to see how many permutations there are of nine items.

Let's demonstrate another macro that executes a BASIC program as part of its computations. The formula for the number of unique subsets of size k items which can be made from a set of n things is as follows:

$$\frac{n!}{k!(n-k)!}$$

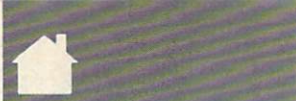
This formula has two variables, so we'll adopt the convention that n is entered first followed by k . Enter 4 and then 3 to put two values to work in the stack. Now press R and type SUBSET followed by a Return to begin recording. Now press the following keys. The explanation of each keystroke follows.

Keys	Function
0 P	put k in memory 0
W	swap X and Y
1 P	put n in memory 1
W	swap X and Y
-	$n-k$
M!	$(n-k)!$
0 F	fetch k
M!	$k!$
*	$k!(n-k)!$
1 F	fetch n
M!	$n!$
W	swap X and Y
/	final result
R	end the macro

Note that this macro calls a BASIC program three times and uses the ! macro. Macros can call any number of BASIC programs, can be nested up to ten deep, and can be up to 4090 bytes long. 4096 bytes have been allocated for macro storage.

Numeric Functions

Here's a list of *SciCalc 64*'s numeric functions and their explanations. The



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results of most operations appear in the X register.

C=-D Set Degrees mode for trigonometric functions.

C=-R Set Radians mode for trigonometric functions.

C=-G Set Gradients mode for trigonometric functions.

+ Change the sign of X. For example, 5.5 would become -5.5, and -5.5 would become 5.5.

Shift-A Compute the absolute value of X.

Shift-D Compute the logarithm of X to the base 10. The decimal logarithm of 100 is 2.

Shift-E This returns the value of 10 raised to the exponent X. For example, if X = 2, the value 100 is returned.

Shift-N Compute the logarithm of X to the base e (2.718281828). For example, if X = 100, the value 4.605170186 is returned.

Shift-X This returns the value of e (2.718281828) raised to the exponent X. For example, if X = 4.605170186, the value 100 is returned.

Shift-T Compute the square root of X.

Shift-Q Compute the square of X.

Shift-I Compute the integer value of X, stripping X of any fractional value. For example, 3.456 would become 3.

Shift-F Compute the fractional value of X, stripping X of any integer value. For example, 3.456 would become 0.456.

Shift-V Compute the reciprocal of X (the value 1/X). For example, 5 would become 1/5 or 0.2.

Shift-3 Compute a random number and put it in the X register. This function is implemented using BASIC's RND(0) function.

Shift-π Put the value of pi (π) in the X register.

Ctrl-I Compute the sine of X.

Ctrl-O Compute the cosine of X.

Ctrl-A Compute the tangent of X.

Ctrl-S Compute the inverse or arc sine of X.

Ctrl-C Compute the inverse or arc cosine of X.

Ctrl-G Compute the inverse or arc tangent of X.

***** Multiply Y times X.

/ Divide Y by X.

Shift-S Modulus. Divide Y by X. The

remainder is left in X. For example, if Y = 9 and X = 5, the result would be 4.

↑ Compute Y to the power X.

Shift-R Compute the Xth root of Y.

For example, if Y = 64 and X = 3, the cube root of 64 is returned, namely 4.

+ Add Y to X.

- Subtract X from Y.

Memory Register Commands

F Fetch. Copy a number from a memory register to X. The memory registers are numbered from 0 to 99.

Type the number of the register you wish to access; then type F.

P Put. Copy a number from X to a memory register. The memory registers are numbered from 0 to 99.

Type the number of the register you wish to store to; then type P.

Cursor Up Display the next higher set of memory registers.

Cursor Down Display the next lower set of memory registers.

Stack Commands

SciCalc 64 implements several functions which allow you to manipulate the stack. They are listed below.

W Swap Y and X. Put the value in X into Y, and vice versa.

O Roll. Move a stack entry into X. The stack entries are numbered from 1 to 49, with 1 the top entry (the X register) and 49 the bottom entry. Entry 50 is inaccessible with the Roll or Pick functions. Type the number of the entry you wish to move into X; then type O. Typing 1 O duplicates the top entry. Typing 2 O is equivalent to the Swap operation.

I Pick. Copy a stack entry into X. The stack entries are numbered from 1 to 49, with 1 the top entry (the X register) and 49 the bottom entry. Entry 50 is inaccessible with the Roll or Pick functions. Type the number of the entry you wish to copy into X; then type I.

Return Press Return when not in input mode to duplicate the top stack entry. If the calculator is in input mode (a cursor is displayed on the top stack entry), press Return to leave input mode; then press Return again to duplicate.

Del Hit Del when not in input mode to delete the top stack entry. If the

calculator is in input mode (a cursor is displayed on the top stack entry), press Return to leave input mode; then press Del to delete.

Clear Commands

Shift-Clr These keys clear the calculator, including the stack, memory registers, macros, and BASIC programs. You must type Y and then press Return at a prompt before clearing takes place.

Shift-Inst Use these keys to clear the stack and memory registers. Macros and BASIC programs are untouched. You must type Y and then press Return at a prompt before clearing takes place.

BASIC Programs

C=-L Load a single BASIC program into the calculator. Type the program filename and then press Return. The program is loaded from disk device 8.

C=-S Save all BASIC programs. The calculator can have numerous BASIC programs in memory at the same time. This command saves all the programs currently in memory to disk in one file. The C=-A command can then be used to load this file.

C=-A Load a file of BASIC programs saved with the C=-S command.

C=-B Display a list of all the BASIC programs that have been loaded with C=-L and/or C=-A.

B Execute a BASIC program which has been loaded with C=-L or C=-A. Enter the program name at the prompt.

C Clear the screen; then execute a BASIC program which has been loaded with C=-L or C=-A. Enter the program name at the prompt. After the program finishes executing, the calculator screen will be redrawn.

X Exit to the BASIC environment. While in BASIC, you can perform any normal BASIC operation, such as running or creating programs. Type SYS2065; then press Return to reactivate the calculator.

Macros

R Record a macro. Enter the macro name; then press Return. Enter the information or instructions you want recorded; then press R again to terminate recording.



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S Save all defined macros to disk in a single file. Enter the filename at the prompt; then press Return.

L Load macros from disk. Enter the filename at the prompt; then press Return.

Z Define whether or not the screen should be constantly updated when a macro is executing. Type 0 Z to disable screen updating. Type 1 Z to enable it. The default mode is enabled. Macros execute much faster with screen updating disabled, but errors in macro logic are more easily found with screen updating enabled.

C=-M List the names of all defined macros.

Shift-M Execute a macro. Enter the macro name at the prompt; then press Return.

M Execute a one- or two-letter macro name. Type M and then the macro letter(s). This is a convenience for quick execution of often-used macros.

Miscellaneous Commands

Q Quit the calculator. Use this command only when you are finished with the calculator. Type Y at the prompt and then press Return.

D Redraw the calculator screen. □

SCICALC 64

```
0801:0C 08 0A 00 9E 20 32 30 64
0809:36 32 00 00 00 4C ED 08 D5
0811:4C 07 09 8A 10 03 4C 71 69
0819:08 38 E9 01 48 2C A8 1A E6
0821:10 03 20 93 08 20 E7 14 DB
0829:20 DA 15 68 20 F5 0A 20 36
0831:5E 08 A0 00 8C A9 1A B1 77
0839:FB 08 29 7F 20 D2 FF C8 7B
0841:28 10 F4 20 E7 14 20 7D 57
0849:0D 20 45 52 52 4F 52 00 2A
0851:20 06 15 C9 85 D0 F9 20 B5
0859:D7 0A 4C 2A 09 20 12 0B FB
0861:20 7D 0D 92 D0 D2 C5 D3 DC
0869:D3 20 C6 31 3A 20 00 60 0A
0871:20 93 08 2C A9 1A 10 03 13
0879:20 1A 0B 20 AD 15 A9 00 1A
0881:8D A9 1A 20 90 FF 4C 2A 4F
0889:09 20 A4 0F 20 CD 0D 4C 4A
0891:D7 0A A0 00 8C AB 1D 8C FD
0899:AA 1D 8C AB 1D 8C A8 1A 29
08A1:B1 2F D9 F1 18 F0 01 60 97
08A9:C8 C0 07 90 F3 A9 FC 85 FD
08B1:2D A9 02 85 23 A9 AE 85 78
08B9:F7 A9 1A 85 F8 A5 2F 85 0E
08C1:F9 A5 30 85 FA 08 A9 30 12
08C9:78 85 01 78 A0 00 C4 22 CF
08D1:D0 0C C6 23 10 08 A9 37 83
08D9:85 01 28 A9 EF 60 B1 F9 6B
08E1:91 F7 C8 D0 E9 E6 FA E6 A6
08E9:F8 4C CF 08 20 E7 14 20 EC
08F1:2F 11 A9 00 8D AC 1D 8D F9
08F9:AA 1D 8D AB 1D 8D F6 1D 3D
0901:20 AE 19 20 44 A6 20 72 63
```

```
0909:0A A9 14 8D 00 03 A9 08 4D
0911:8D 01 03 A9 71 8D 02 03 ED
0919:A9 08 8D 03 03 20 1A 0B BB
0921:20 99 0F 20 CD 0D 20 D7 48
0929:0A A2 FB 9A 20 F5 14 20 33
0931:36 09 4C 2A 09 AA E0 2E AF
0939:D0 13 2C AA 1D 70 48 20 04
0941:0F 0D B0 43 AD AA 1D 09 C3
0949:40 8D AA 1D 60 E0 45 D0 E7
0951:13 2C AA 1D 30 31 20 0F B4
0959:0D B0 2C AD AA 1D 09 80 DA
0961:8D AA 1D 60 E0 2D D0 16 02
0969:2C AA 1D 10 0D AC AC 1D 72
0971:B9 FF 01 C9 45 D0 03 4C DC
0979:0F 0D 8A 4C 89 09 8A 20 12
0981:E6 0C 90 04 20 0F 0D 60 14
0989:C9 14 D0 35 2C AB 1D 30 6D
0991:06 20 61 0F 4C 27 0E AC 93
0999:AC 1D D0 03 4C 31 0D B9 8E
09A1:FF 01 AE AA 1D F0 14 C9 13
09A9:45 D0 06 8A 29 7F 4C B9 95
09B1:09 C9 2E D0 06 8A 29 BF F9
09B9:8D AA 1D CE AC 1D 4C 31 71
09C1:0D C9 0D 00 11 2C AB 1D 29
09C9:10 06 20 3C 0F 4C 27 0E 33
09D1:20 55 0F 4C 27 0E 20 8D 2F
09D9:0A 90 1F 98 48 20 36 0F C0
09E1:20 9F 0E 68 A8 B9 88 12 83
09E9:8D F9 09 B9 89 12 8D FA A8
09F1:09 20 F8 09 4C 22 0A 4C 8B
09F9:F8 09 20 93 0A 90 2B 98 89
0A01:48 20 36 0F 68 A8 B9 D8 2B
0A09:12 8D F9 09 B9 D9 12 8D 40
0A11:FA 09 20 9F 0E 20 93 0E 09
0A19:20 D6 0E 20 F8 09 20 61 44
0A21:0F 20 C4 0D 20 FF 0E 4C 97
0A29:27 0E 20 87 0A 90 19 98 2E
0A31:48 20 36 0F 68 A8 B9 6C EE
0A39:11 8D F9 09 B9 6D 11 8D 3C
0A41:FA 09 20 F8 09 4C CD 0D CA
0A49:C9 DE D0 10 20 36 0F 20 2D
0A51:55 0F A2 A8 AE 20 A3 56
0A59:0E 4C 22 0A C9 23 F0 01 2A
0A61:60 20 36 0F 20 55 0F A9 83
0A69:00 20 9A 0E 4C 22 0A 18 FD
0A71:24 38 A2 03 BD 00 03 B0 CE
0A79:03 BD BC 1D 9D BC 1D 9D 9F
0A81:00 03 CA 10 EF 60 A2 6B 62
0A89:A0 11 D0 0A A2 87 A0 12 73
0A91:D0 04 A2 D7 A0 12 86 FB 37
0A99:84 FC AA A0 00 8A D1 FB 58
0AA1:F0 0A 18 B1 FB F0 05 C8 45
0AA9:C8 C8 D0 F1 8A 60 20 9B 3F
0AB1:BC A5 65 A4 64 60 A9 20 9C
0AB9:4C D2 FF 20 12 0B 20 7D 25
0AC1:0D 92 20 D0 D2 C5 D3 3B
0AC9:20 C1 20 CB C5 D9 20 2E 23
0AD1:2E 2E 00 20 06 15 20 12 61
0AD9:0B 20 FF 0C A9 20 A0 25 70
0AE1:20 D2 FF 88 D0 FA 60 18 8E
0AE9:20 F0 FF 20 7D 0D 92 F0 82
0AF1:0F 20 00 60 AA A9 9E 85 5A
0AF9:FB A9 A1 85 FC A0 00 CA 38
0B01:30 0E B1 FB 48 E6 FB D0 4F
0B09:02 E6 FC 68 10 F4 30 EF A4
0B11:60 A0 01 A2 16 18 4C F0 64
0B19:FF 20 7D 0D 09 0E 08 93 DB
0B21:12 B0 C0 B2 F0 0F C0 B2 A7
0B29:C0 C0 B2 F0 0F C0 B2 AE C4
0B31:0D 12 DD D8 DD F0 0F 20 8C
0B39:DD 20 20 DD F0 0F 20 DD 0A
0B41:DD 0D 12 DD D9 DD F0 0F E0
0B49:20 DD 20 20 DD F0 0F 20 DD
0B51:DD DD 0D 12 DD 20 DD F0 AC
0B59:0F 20 DD 20 20 DD F0 26
0B61:20 DD DD 0D 12 DD 20 DD B1
0B69:F0 0F 20 DD 20 20 DD F0 CB
0B71:0F 20 DD DD 0D 12 DD 20 3D
0B79:DD F0 0F 20 DD 20 20 DD 2C
0B81:F0 0F 20 DD DD 0D 12 DD DA
0B89:20 DD F0 0F 20 DD 20 20 0F
0B91:DD F0 0F 20 DD DD 0D 12 49
0B99:DD 20 DD F0 0F 20 DD 20 46
0BA1:20 DD F0 0F 20 DD DD 0D 8F
0BA9:12 DD 20 DD F0 0F 20 DD 04
0BB1:20 20 DD F0 0F 20 DD DD 3D
0BB9:0D 12 DD 20 DD F0 0F 20 89
0BC1:DD 20 20 DD F0 0F 20 DD 92
0BC9:DD 0D 12 DD 20 DD F0 0F 9B
0BD1:20 DD 20 20 DD F0 0F 20 66
0BD9:DD DD 0D 12 DD 20 AD F0 D4
0BE1:0F C0 BD 20 20 AD F0 0F 12
0BE9:C0 BD DD 0D 12 DD F0 04 4A
0BF1:20 B0 C0 C0 C0 C0 C0 B3
0BF9:C0 C0 C0 AE F0 16 20 DD A1
0C01:0D 12 DD F0 04 20 DD 20 6B
0C09:44 45 47 52 45 45 53 20 A8
0C11:DD F0 16 20 DD 0D 12 DD 3E
0C19:F0 04 20 AB C0 C0 C0 C0 B4
0C21:C0 C0 C0 C0 C0 C0 B3 16 BA
0C29:20 DD 0D 12 DD F0 04 20 66
0C31:DD 20 52 41 44 49 41 4E B6
0C39:53 20 DD F0 16 20 DD 0D C7
0C41:12 DD F0 04 20 AB C0 C0 2A
0C49:C0 C0 C0 C0 C0 C0 B3 54
0C51:F0 16 20 DD 0D 12 DD F0 A6
0C59:04 20 DD 47 52 41 44 49 15
0C61:45 4E 54 53 DD F0 16 20 6E
0C69:DD 0D 12 DD F0 04 20 AB 57
0C71:C0 C0 C0 C0 C0 C0 C0 89
0C79:C0 B3 F0 16 20 DD 0D 12 03
0C81:DD F0 04 20 DD 20 52 45 A0
0C89:43 4F 52 44 20 20 DD F0 D3
0C91:16 20 DD 0D 12 DD F0 04 37
0C99:20 AD C0 C0 C0 C0 C0 C0 9C
0CA1:C0 C0 C0 BD F0 16 20 DD 3C
0CA9:0D 12 AB F0 25 C0 B3 0D F1
0CB1:12 DD F0 25 20 DD 0D 12 5F
0CB9:AD F0 25 C0 BD 0D 20 D2 CA
0CC1:D0 CE 20 C3 41 4C 43 55 4D
0CC9:4C 41 54 4F 52 20 42 59 C8
0CD1:20 D2 4F 42 45 52 54 20 F8
0CD9:D2 4F 43 4B 45 46 45 4C 66
0CE1:4C 45 52 00 60 C9 3A B0 0B
0CE9:03 C9 30 60 18 60 C9 20 F7
0CF1:90 0A C9 80 90 F6 C9 A0 AA
0CF9:90 02 B0 F0 38 60 48 A9 7D
0D01:92 20 D2 FF 68 60 48 A9 C5
0D09:12 20 D2 FF 68 60 8A 2C 94
0D11:AB 1D 30 0E CE AB 1D 48 D6
0D19:20 55 0F 20 27 0E 20 7A A8
0D21:0F 68 AC AC 1D C0 F0 90 D7
0D29:01 60 99 00 02 EE AC 1D 51
0D31:20 4B 0E D0 01 60 A2 01 CC
0D39:A0 03 20 E8 0A AD AC 1D 74
0D41:F0 2A 49 FF 38 69 0F 18 25
0D49:69 03 A8 A2 01 18 20 F0 B1
0D51:FF 20 FF 0C A0 00 B0 00 AC
0D59:02 C8 CC AC 1D B0 05 20 E0
0D61:D2 FF 90 F2 20 0D 20 7D
0D69:D2 FF 18 60 A0 11 A2 01 85
0D71:18 20 F0 FF 20 07 0D A9 9E
0D79:30 4C D2 FF 48 8A 48 98 AE
0D81:48 20 AC 0D F0 1F C9 F0 B6
0D89:D0 16 20 AC 0D F0 16 85 3E
0D91:B7 20 AC 0D F0 0F 20 D2 CC
0D99:FF C8 C4 B7 D0 F8 F0 E1 28
0DA1:20 D2 FF 90 DC 68 A8 68 CB
0DA9:AA 68 60 BA FE 06 01 D0 CD
0DB1:03 FE 07 01 BD 06 01 85 8B
0DB9:BB BE 07 01 85 BC A0 00 72
0DC1:B1 BB 60 A9 B5 85 FB A9 AE
```


PROGRAMS

0DC9:1A	85	FC	60	20	27	0E	20	D1	1029:85	FB	98	65	FC	85	FC	60	CC	1289:BC	C6	C0	11	D6	D5	11	5F	76
0DD1:4B	0E	D0	01	60	A9	01	8D	78	1031:A2	12	4C	14	08	20	9F	0E	FF	1291:B4	BF	C1	58	BC	CE	EA	B9	6E
0DD9:B7	1D	A9	16	8D	B8	1D	AD	E4	1039:20	F7	B7	20	61	0F	A5	15	08	1299:D8	ED	BF	C4	65	12	C5	6F	58
0DE1:AA	1A	85	FB	AD	AB	1A	85	1E	1041:D0	EE	60	A5	14	C9	64	B0	2D	12A1:12	D1	CC	11	D4	71	BF	09	E2
0DE9:FC	AD	B8	1D	38	E9	03	A8	EE	1049:E7	A0	00	84	FC	0A	26	FC	27	12A9:E2	11	0F	E8	11	01	EE	11	6F
0DF1:AE	B7	1D	18	20	F0	FF	20	5B	1051:0A	26	FC	18	65	14	85	FB	A3	12B1:13	07	12	03	F4	11	07	5F	EC
0DF9:07	0D	AD	AC	1A	F0	03	09	FE	1059:90	02	E6	FC	60	20	1C	10	BA	12B9:12	00	20	12	BB	20	C0	11	FC
0E01:30	2C	A9	20	20	D2	FF	AD	71	1061:A5	14	F0	CC	99	32	B0	C8	85	12C1:20	C4	0D	20	D6	0E	4C	2B	7D
0E09:B7	1D	38	E9	01	09	30	20	9A	1069:C6	14	20	44	10	A6	FB	8A	D7	12C9:BA	20	D5	11	A2	BA	A0	1A	7A
0E11:D2	FF	20	FF	0C	20	5A	0E	3E	1071:60	20	5E	10	48	A0	00	BD	19	12D1:20	D2	0E	4C	7B	BF	2B	6A	DC
0E19:20	93	0E	EE	B7	1D	AD	B7	20	1079:B5	1A	99	AD	1D	C8	E8	C0	A7	12D9:B8	2D	53	B8	2A	2B	BA	2F	3E
0E21:1D	C9	0B	90	C4	60	20	4B	DB	1081:05	90	F4	68	A8	20	63	0F	09	12E1:12	BB	D3	BB	12	5E	7B	BF	F4
0E29:0E	D0	01	60	A9	01	8D	B7	CA	1089:20	55	0F	A2	00	BD	AD	1D	8A	12E9:D2	CA	12	00	20	D3	C1	D6	17
0E31:1D	A9	03	8D	B8	1D	20	C4	BE	1091:9D	B5	1A	E8	E0	05	90	F5	F1	12F1:C5	20	CD	C1	C3	D2	CF	D3	B3
0E39:0D	20	5A	0E	20	93	0E	EE	6A	1099:60	A9	05	AA	D0	D6	AD	AA	87	12F9:3F	00	20	CC	CF	C1	C4	20	BD
0E41:B7	1D	AD	B7	1D	C9	0B	90	68	10A1:1A	18	69	32	8D	AA	1A	AD	1E	1301:CD	C1	C3	D2	CF	D3	3F	00	70
0E49:F0	60	AD	C2	1D	0D	D7	1D	C1	10A9:AB	1A	69	00	8D	AB	1A	EE	91	1309:20	C5	D8	C5	C3	D5	D4	C5	00
0E51:D0	03	69	01	60	AD	AD	1A	03	10B1:AC	1A	AD	AC	1A	C9	0A	90	CB	1311:20	CD	C1	C3	D2	CF	3F	00	83
0E59:60	AE	B7	1D	AC	B8	1D	20	BC	10B9:0F	A9	B6	8D	AA	1A	A9	1B	A7	1319:20	D2	C5	C3	CF	D2	C4	20	6C
0E61:E8	0A	20	A7	0E	20	DD	BD	5D	10C1:8D	AB	1A	A9	00	8D	AC	1A	1B	1321:CD	C1	C3	D2	CF	3F	00	A2	62
0E69:A0	00	B9	00	01	F0	03	C8	A7	10C9:60	AD	AA	1A	38	E9	32	8D	D7	1329:09	A9	13	20	67	19	20	FB	7E
0E71:D0	F8	98	49	FF	38	69	0F	9E	10D1:AA	1A	AD	AB	1A	E9	00	8D	44	1331:14	8D	01	02	A9	01	8D	00	71
0E79:18	6D	B8	1D	A8	AE	B7	1D	72	10D9:AB	1A	CE	AC	1A	10	0F	A9	D3	1339:02	20	C1	19	B0	2C	20	FB	A4
0E81:18	20	F0	FF	A0	00	B9	00	48	10E1:78	8D	AA	1A	A9	1D	8D	AB	21	1341:14	8D	02	02	EE	00	02	D0	81
0E89:01	F0	06	20	D2	FF	C8	D0	1E	10E9:1A	A9	09	8D	AC	1A	60	A2	AC	1349:0A	A2	09	A9	13	20	FF	18	0A
0E91:F5	60	A5	FB	18	69	05	85	2B	10F1:AA	A9	15	20	A0	19	F0	01	C2	1351:D0	01	60	20	C1	19	B0	12	14
0E99:FB	90	F6	E6	FC	60	A2	B5	89	10F9:60	6C	FC	FF	A2	85	A9	0F	92	1359:20	5E	08	20	7D	0D	4E	4F	36
0EA1:A0	1A	86	FB	84	FC	A0	00	7E	1101:20	A0	19	F0	01	60	A9	B5	20	1361:20	4D	41	43	52	4F	00	4C	63
0EA9:B1	FB	85	61	84	70	C8	B1	8D	1109:85	FB	A9	1A	85	FC	A0	00	25	1369:44	08	AD	C2	1D	F0	31	98	3D
0EB1:B7	85	66	09	80	85	62	C8	32	1111:98	91	FB	E6	FB	D0	02	E6	DF	1371:48	A2	00	AC	D7	1D	C0	1E	02
0EB9:A2	00	B1	FB	95	63	E8	C8	F1	1119:FC	A5	FB	C9	AD	A5	FC	E9	27	1379:90	15	20	5E	08	20	7D	0D	DF
0EC1:C0	05	90	F6	A5	66	45	6E	C0	1121:1D	90	ED	60	A2	8D	A9	0F	67	1381:4D	41	43	52	4F	20	53	54	22
0EC9:85	6F	A5	61	60	A2	B5	A0	E8	1129:20	A0	19	F0	01	60	20	07	86	1389:41	43	4B	00	4C	44	08	BD	CB
0ED1:1A	86	FB	84	FC	A0	00	B1	80	1131:11	A9	00	8D	00	B0	8D	01	FD	1391:C0	1D	99	D8	1D	E8	C8	E0	1F
0ED9:FB	85	69	C8	B1	FB	85	6E	06	1139:B0	8D	00	A0	8D	01	A0	A9	7C	1399:03	90	F4	8C	D7	1D	68	A8	79
0EE1:45	66	85	6F	B1	FB	09	80	F1	1141:00	8D	A5	1A	A9	A0	8D	A6	AE	13A1:C8	98	38	65	F9	8D	C0	1D	54
0EE9:85	6A	C8	A2	00	B1	FB	95	FA	1149:1A	A9	00	8D	A3	1A	A9	B0	45	13A9:A5	FA	69	00	8D	C1	1D	20	5C
0EF1:6B	E8	C8	C0	05	90	F6	A5	21	1151:8D	A4	1A	60	20	36	10	A5	4C	13B1:B8	14	8C	C2	1D	4C	D7	0A	CA
0EF9:61	60	86	FB	84	FC	20	1B	E2	1159:14	8D	AD	1A	60	20	70	0A	AE	13B9:2C	C5	1D	10	4B	A0	10	B9	C2
0F01:BC	A0	00	A5	61	91	FB	84	CD	1161:A9	93	20	D2	FF	A2	80	6C	66	13C1:C6	1D	99	00	02	88	10	F7	10
0F09:70	C8	A5	66	09	7F	25	62	9F	1169:00	03	AC	99	0F	B2	9F	0F	0D	13C9:AD	A5	1A	85	FB	AD	A6	1A	C9
0F11:91	FB	C8	A2	00	B5	63	91	69	1171:A5	9C	0F	51	F0	10	44	DA	AF	13D1:85	FC	20	54	1A	A9	00	8D	48
0F19:FB	E8	C8	C0	05	90	F6	60	4D	1179:15	94	FD	10	93	25	11	49	A8	13D9:C5	1D	20	A4	0F	AE	C3	1D	50
0F21:A9	00	85	22	A9	02	85	23	6A	1181:07	10	4F	72	10	57	9A	10	5F	13E1:86	22	AC	1D	84	23	E8	DF	
0F29:AD	AC	1D	20	B5	B7	A2	B5	76	1189:46	E8	0F	50	F9	0F	91	9F	BE	13E9:D0	01	C8	8E	A5	1A	8C	A6	10
0F31:A0	1A	4C	FB	0E	2C	AB	1D	05	1191:10	11	CA	10	CD	4A	13	4D	65	13F1:1A	8A	38	E5	FB	48	98	E5	45
0F39:30	01	60	A9	00	8D	AB	1D	01	1199:28	13	52	B9	13	53	24	15	BD	13F9:FC	AA	A9	00	A8	91	22	C8	17
0F41:8D	AA	1D	AC	AC	1D	F0	09	04	11A1:4C	0E	15	5A	55	11	B6	4A	5C	1401:91	22	C8	91	22	4C	A8	16	56
0F49:20	21	0F	A9	00	8D	AC	1D	E8	11A9:16	B0	B5	16	AE	95	17	42	57	1409:A2	19	A9	13	20	FF	18	D0	31
0F51:60	4C	7A	0F	A0	F5	B9	B4	F7	11B1:45	18	43	3B	18	58	5E	11	88	1411:04	8D	C6	1D	60	A0	10	B9	B1
0F59:1A	99	B9	1A	88	D0	F7	60	9B	11B9:BF	CD	15	A7	C7	15	00	20	FE	1419:00	02	99	C6	1D	88	10	F7	84
0F61:A0	00	B9	BA	1A	99	B5	1A	6F	11C1:79	12	20	CC	BC	20	80	12	6F	1421:20	C1	19	90	10	A9	00	85	A2
0F69:C8	C0	F5	90	F5	A0	00	98	AE	11C9:4C	53	B8	20	0C	BC	20	C5	59	1429:AE	A9	B0	85	AF	20	F1	19	7C
0F71:99	AA	1B	C8	C0	05	90	F8	2B	11D1:0E	4C	2B	BA	20	DB	11	4C	FD	1431:A2	02	20	68	1A	AD	C6	1D	E7
0F79:60	A0	04	A9	00	99	B5	1A	F6	11D9:12	BB	A2	7B	A0	1A	4C	D2	D8	1439:18	69	03	6D	A5	1A	8D	C3	73
0F81:88	10	FA	60	20	C3	CC	C5	94	11E1:0E	20	22	12	4C	6B	E2	20	6E	1441:1D	AD	A6	1A	69	00	8D	C4	05
0F89:C1	D2	3F	00	20	C3	CC	C5	94	11E9:22	12	4C	64	E2	20	22	12	5F	1449:1D	A2	FF	8E	C5	1D	4C	A4	71
0F91:C1	D2	20	C1	CC	CC	3F	00	7D	11F1:4C	B4	E2	20	36	12	20	B4	B4	1451:0F	AD	C2	1D	D0	07	20	D2	4C
0F99:A2	80	2C	A2	40	2C	A2	00	D0	11F9:BF	A2	80	A0	1A	20	D2	0E	C3	1459:14	F0	14	30	F4	20	B8	14	FA
0FA1:8E	A7	1A	2C	A7	1A	30	05	02	1201:20	6A	B8	4C	0A	12	20	36	BA	1461:8D	C2	1D	98	EE	C0	1D	D0	B3
0FA9:70	06	A9	0F	2C	A9	0D	2C	F5	1209:12	2C	A7	1A	30	09	70	01	5F	1469:4B	EE	C1	1D	4C	B5	14	A5	04
0FB1:A9	11	48	20	07	0D	A2	0D	B2	1211:60	A2	8A	A0	1A	D0	04	A2	28	1471:C6	F0	41	20	EA	FF	2C	C5	A8
0FB9:86	22	A0	03	A6	22	18	20	F5																		



PROGRAMS

14E9:00	8D	C5	1D	8D	C2	1D	8D	3F	1749:85	AF	D0	08	A9	00	85	AE	C7	19A9:59	60	A9	4E	60	A9	F6	85	D7
14F1:D7	1D	68	60	20	52	14	F0	C3	1751:A9	B0	85	AF	86	FB	84	FC	56	19B1:2B	85	F7	85	7A	A9	1D	85	6C
14F9:FB	60	20	F5	14	20	EF	0C	A8	1759:A2	01	20	C6	FF	B0	C4	20	F5	19B9:2C	85	F8	85	7B	E6	2B	60	09
1501:B0	F8	4C	D2	FF	20	E4	FF	C2	1761:19	17	A0	00	20	24	1A	E6	A2	19C1:A9	00	85	F9	A9	A0	85	FA	EE
1509:C9	00	F0	F9	60	A0	09	A2	10	1769:FB	D0	02	E6	FC	24	90	70	82	19C9:20	2C	1A	D0	02	18	60	C8	61
1511:ED	A9	12	20	E6	16	D0	01	13	1771:0E	A5	FB	C5	AE	A5	FC	E5	D7	19D1:20	38	1A	CD	00	02	D0	12	FD
1519:60	20	CC	FF	A2	00	A0	A0	0C	1779:AF	90	E4	A9	10	D0	A4	20	08	19D9:A2	00	C8	20	38	1A	DD	01	5F
1521:4C	4D	17	A2	ED	A9	12	20	2C	1781:30	18	A5	FB	85	F9	A5	FC	9E	19E1:02	D0	07	E8	EC	00	02	90	B4
1529:FF	18	D0	01	60	A9	00	85	B2	1789:85	FA	A0	00	98	20	24	1A	F4	19E9:F1	60	20	40	1A	4C	C9	19	E3
1531:F9	A9	A0	85	FA	20	2C	1A	F9	1791:C8	4C	24	1A	A2	7D	A9	15	D0	19F1:A5	F9	85	F7	A5	FA	85	F8	C2
1539:D0	01	60	AD	A5	1A	85	AE	42	1799:20	FF	18	D0	01	60	20	97	49	19F9:A0	00	20	38	1A	48	18	65	8B
1541:AD	A6	1A	85	AF	A0	09	4C	E5	17A1:19	20	2C	1A	D0	01	60	AD	84	1A01:F7	AA	C8	20	38	1A	48	18	C9
1549:B4	17	48	A9	30	78	85	01	A6	17A9:A3	1A	85	AE	AD	A4	1A	85	85	1A09:65	F8	85	FA	86	F9	A5	AE	A4
1551:68	60	48	A9	37	85	01	58	95	17B1:AF	A0	00	84	22	A2	00	AC	70	1A11:38	E5	F9	85	22	A5	AF	E5	5F
1559:68	60	20	CC	CF	C1	C4	20	CF	17B9:00	02	BD	C3	15	99	01	02	6F	1A19:FA	85	23	20	C6	08	68	A8	62
1561:D0	D2	C7	3A	20	CE	C1	CD	D2	17C1:C8	E8	E0	04	90	F4	8C	00	5C	1A21:68	38	60	20	4B	15	91	FB	73
1569:C5	3F	00	20	CC	CF	C1	C4	36	17C9:02	20	59	19	20	C0	FF	90	52	1A29:4C	53	15	A0	00	20	38	1A	10
1571:20	C1	CC	CC	3A	20	CE	C1	34	17D1:03	4C	24	17	A2	01	20	C9	AD	1A31:F0	04	08	C8	28	60	C8	20	E0
1579:CD	C5	3F	00	20	D3	C1	D6	8E	17D9:FF	B0	F6	A9	20	0C	13	17	6C	1A39:4B	15	B1	F9	4C	53	15	A0	A8
1581:C5	20	C1	CC	CC	3A	20	CE	F9	17E1:20	13	17	A5	90	F0	23	20	D0	1A41:00	20	38	1A	18	65	F9	AA	1B
1589:C1	CD	C5	3F	00	20	C5	D8	99	17E9:30	18	20	12	0B	20	7D	0D	3C	1A49:C8	20	38	1A	65	FA	85	FA	AF
1591:C5	C3	D5	D4	C5	3F	00	20	E2	17F1:92	D0	D2	C5	D3	D3	20	C6	49	1A51:86	F9	60	A0	02	A2	00	BD	B5
1599:C3	CC	C5	C1	D2	20	26	20	31	17F9:31	3A	20	46	49	4C	45	20	DD	1A59:00	02	20	24	1A	C8	EC	00	22
15A1:C5	D8	C5	C3	D5	D4	C5	3F	A6	1801:45	58	49	53	54	53	00	4C	84	1A61:02	B0	03	E8	D0	F1	60	49	0A
15A9:00	20	D1	D5	C9	D4	3F	00	93	1809:44	08	A4	22	B9	B1	15	F0	C3	1A69:FF	38	7D	A3	1A	9D	A3	1A	3E
15B1:41	4C	4C	2E	46	49	4C	45	31	1811:06	20	13	17	C8	D0	F5	A0	36	1A71:98	49	FF	7D	A4	1A	9D	A4	89
15B9:00	4D	41	43	2E	46	49	4C	FC	1819:00	20	38	1A	20	13	17	E6	5C	1A79:1A	60	81	00	00	00	00	81	84
15C1:45	00	2C	50	2C	57	A2	00	1D	1821:F9	D0	02	E6	FA	A5	F9	C5	59	1A81:49	F0	DA	A1	86	65	2E	E0	9A
15C9:A0	A0	D0	04	A2	00	A0	B0	CD	1829:AE	A5	FA	E5	AF	90	E8	48	B1	1A89:D4	86	7E	A5	DD	5E	7B	0E	61
15D1:86	F9	84	FA	20	2C	1A	D0	B4	1831:20	CC	FF	A9	01	20	C3	FF	4F	1A91:FA	35	12	7B	00	AD	FC	90	CB
15D9:0F	20	1A	0B	20	A4	0F	20	59	1839:68	60	A2	98	A9	15	20	FF	75	1A99:7F	5E	5B	D8	AA	82	13	5D	01
15E1:D6	0D	20	2D	0E	4C	D7	0A	EC	1841:18	D0	0B	60	A2	8E	A9	15	D0	1AA1:8D	DE	00	B0	00	AA	80	00	E2
15E9:A2	01	A9	14	D0	02	A6	D6	CE	1849:20	FF	18	D0	04	60	A9	FF	8E	1AA9:00	B6	1B	00	80	00	00	00	F2
15F1:48	A0	01	18	20	F0	FF	20	EE	1851:2C	A9	00	8D	A9	1A	20	97	68									
15F9:DA	0A	A9	0D	20	D2	FF	68	CE	1859:19	20	C9	19	B0	05	A2	04	CB									
1601:38	E9	01	D0	E9	A2	01	A0	6D	1861:4C	14	08	C8	84	FB	20	AE	4D									
1609:0C	18	20	F0	FF	20	2C	1A	47	1869:19	A0	00	20	38	1A	38	E5	D0									
1611:D0	06	20	BC	0A	4C	DA	15	43	1871:FB	85	22	C8	20	38	1A	E9	D1									
1619:A6	D6	A0	0C	18	20	F0	FF	46	1879:00	85	23	A5	2B	18	65	22	70									
1621:A0	02	20	38	1A	85	FB	A2	27	1881:85	2D	A5	2C	65	23	85	2E	28									
1629:00	C8	20	38	1A	20	D2	FF	06	1889:A5	FB	18	65	F9	85	F9	A5	64									
1631:E8	E4	FB	90	F4	A9	0D	20	1C	1891:FA	69	00	85	FA	20	C6	08	DF									
1639:D2	FF	20	40	1A	A5	D6	C9	B5	1899:20	59	A6	20	33	A5	A9	00	8A									
1641:14	90	CA	20	BC	0A	4C	D5	73	18A1:20	90	FF	A0	00	B9	F1	18	F2									
1649:15	A2	5B	A9	15	20	FF	18	EF	18A9:99	AE	1A	B9	F8	18	99	AF	3C									
1651:D0	01	60	A9	00	85	F9	A9	80	18B1:1B	C8	C0	07	90	EF	A5	2F	E8									
1659:B0	85	FA	20	C9	19	90	12	86	18B9:85	F2	A5	30	85	F8	A9	FC	C2									
1661:AD	A3	1A	85	AE	AD	A4	1A	78	18C1:85	27	A9	02	85	23	A9	AE	4D									
1669:85	AF	20	F1	19	A2	00	20	DA	18C9:85	F9	A9	1A	85	FA	20	C6	31									
1671:68	1A	20	1F	17	20	8C	19	B9	18D1:08	A9	FC	18	65	2F	85	31	B5									
1679:20	54	1A	A9	00	20	24	1A	8B	18D9:A9	02	65	30	85	32	A9	FF	57									
1681:98	38	65	FB	AA	A5	FC	69	C3	18E1:8D	A8	1A	2C	A9	1A	10	05	E3									
1689:00	A8	20	43	17	A5	FB	38	97	18E9:A9	93	20	D2	FF	4C	AE	A7	3B									
1691:ED	A3	1A	48	A5	FC	ED	A4	07	18F1:43	53	01	01	01	00	32	43	78									
1699:1A	AA	20	8C	19	A5	F9	8D	2B	18F9:4D	FB	01	01	00	64	20	67	39									
16A1:A3	1A	A5	FA	8D	A4	1A	A0	5E	1901:19	AE	B7	1D	AC	B8	1D	18	CE									
16A9:00	68	20	24	1A	8A	C8	20	E2	1909:20	FF	AF	A0	00	CC	00	02	C6									
16B1:24	1A	38	60	A0	00	A2	6C	3A	1911:B0	09	B9	01	02	20	D2	FF	5B									
16B9:A9	15	20	E6	16	D0	01	60	C8	1919:C8	D0	F2	20	7D	0D	12	20	A8									
16C1:20	19	17	85	22	20	19	17	5A	1921:92	20	00	20	F5	14	C9	0D	47									
16C9:85	23	20	CC	FF	AD	A3	1A	6A	1929:F0	22	C9	14	D0	0A	AD	00	E0									
16D1:18	69	02	AA	AC	A4	1A	90	0C	1931:02	F0	CE	0E	00	02	B0	C9	9A									
16D9:01	C8	20	43	17	A5	FC	22	48	1939:20	EF	0C	B0	C4	AC	00	02	DE									
16E1:A6	23	4C	9B	16	84	22	A2	17	1941:C0	10	B0	BD	EE	00	02	99	DE									
16E9:6C	A9	15	20	FF	18	D0	01	5E	1949:01	02	90	B5	20	D7	0A	A9	08									
16F1:60	20	1F	17	A2	01	20	C6	CB	1951:01	A0	02	A2	08	20	BA	FF	CC									
16F9:FF	B0	28	A4	22	20	19	17	7C	195																	



PROGRAMS

R O B E R T M A R C U S

Designing air-core coils for short-wave radios or other electronic circuits requires complicated formulas and trial-and-error adjustments. *CoilCalc* is a computer-aided design program that should be an invaluable aid to ham radio operators or other electronic hobbyists.

Coils are important components of tuning circuits found in radio transmitters and receivers. When designing an air-core coil for a tuned circuit, the inductance of such a single layer coil is dependent on three variables: coil diameter, coil length, and the number of turns of wire in the coil. As a condition of the number of turns, wire size is a related factor.

Change any of these variables, and you change the inductance of the coil. Inductance is measured in units called *henries*.

Using a computer to do the number-crunching can make the selection of an inductor much easier. *CoilCalc* is a program that will calculate the inductance of a coil from its parameters; or if the inductance is known and you're winding your own coils, it will calculate coil length, coil diameter, and number of turns (wire size).

Getting Started

CoilCalc is written entirely in BASIC. To help prevent typing errors, use *The Automatic Proofreader* to type it in; see "Typing Aids" elsewhere in this section. When you've finished typing, be sure to save a copy of the program.

How to Use the Program

If you have a coil whose inductance is not known or if you need to know the inductance of a tuned circuit, select the inductance-unknown option after you've run *CoilCalc*. The calculation of the coil parameters is done initially with the wire size as specified. This is done on the basis that the coils will be closely wound with the maximum number of turns used for the length considered.

A custom calculation can be selected where the number of turns is used to obtain a more accurate result.

Also, the dimensions may be tailored more exactly to fractional ones, with the resulting change to the inductance given as a percentage. When the wire size becomes larger than 10 percent of the coil diameter, it's best to use the custom option. In this mode the wire's diameter is included with the coil diameter for increased accuracy.

COILCALC

USE YOUR 64 TO
DESIGN COILS FOR
ELECTRONIC
CIRCUITS

Keep in mind, however, that the result is approximately the true value; the actual value will be affected by the effects of the distributed capacitance. *CoilCalc*'s calculations are based on the use of enameled wire. Should you wish to change to a different type of wire, the data statements giving the number of turns per linear inch for enameled wire, 8 gauge through 40 gauge, can be changed to suit.

An Example

Let's try an example. Suppose you wish to find the inductance of a coil having 8 turns of #12 enamel wire wound over 1 inch, with a inside diameter of 0.5 inch.

The menus will direct you to the inductance of a coil where you'll be asked to enter the wire gauge, coil diameter, and coil length. Supply the above figures. *CoilCalc* will then display the inductance as 0.69 microhenries. This is based on a closely wound coil, having the maximum of 12 turns of #12 wire over the one inch. Additional variables, however, may affect the accuracy of this calculation.

Need More Accuracy?

Assume the coil in question, however, is loosely wound and that the wire diameter is larger than 10 percent of the coil's diameter. In this case we should select the custom option by hitting the Ctrl key. This option now asks for the number of turns, which would be entered as 8, followed by the coil diameter and length as before. The new inductance value will be displayed as 0.4 microhenries, a more accurate value for this particular coil. The percent of change is also given, but in this case we aren't concerned with the resulting change.

Select the custom option again, but this time enter 12 turns with the same diameter and length as before. *CoilCalc* now indicates an inductance of 0.9 microhenries; this value compared to the original of 0.69 is the result of increased accuracy, as the wire diameter is included in the calculations. This shows that when dealing with small coils and large wire sizes, the custom design option should be consulted.

Run the program again. This time select the known-inductance option and assume you want a coil whose inductance is 25 microhenries. Suppose we plan to use #22 wire on a form having a diameter of 1.5 inches. How long will the coil have to be? Again *CoilCalc* will ask for the wire size and coil diameter, but because the inductance is known, it will calculate the length for you.

If you provide the length, the program will determine what diameter the coil should have. If you provide any two parameters, *CoilCalc* calculates the third. On completion of the calculation, an approximate figure of 0.65 inch using 24 turns would be indicated. This also gives a tolerance of 3.3 percent, indicating the inductance is 3.3 percent higher than requested.

Now select the custom option so you may tailor the parameters to more convenient fractional sizes. Entering different values of turns and length will allow you to obtain a



PROGRAMS

length or a number of fractional turns that's best suited to you. You'll find, for example, 25 turns and a length of 0.75 inch give a value of 25.8 microhenries, or 3.2-percent higher; 27 turns and a length of 1 inch give 25.11 microhenries, or 4-percent higher. If you enter a value of turns for a given length that exceeds turns/inch of the wire gauge selected, you're told that the gauge has changed.

CoilCalc limits the calculation of lengths up to 4 inches and not less than 0.05 inch. You should make a change in wire size or coil diameter when this limit is reached.

COILCALC

```
KH 0 REM COPYRIGHT 1991 COMPUTE PUBLICATIONS INTL LTD - ALL RIGHTS RESERVED
HD 100 REM * * INITIALIZE * *
EM 110 HD$="{RVS} INDUCTOR {3 SPACES} DESIGN {OFF}"
QF 120 DIMTN(40):FORI=8TO40:RE ADTN(I):NEXT
RR 130 DEFFNPU(X)=3*VAL(CD$)*I N+9*IN*(X):DEFFNN(X)=T N(GA)*2*.2*VAL(CD$)*2*X
CE 140 POKE53280,0:POKE53281,0 :POKE646,7
JH 150 REM * * MENU PAGE * *
GG 160 PRINT "{CLR}{4 RIGHT}"HD $
BE 170 PRINT "{DOWN}{RIGHT}PARA METERS FOR A SINGLE-LAY ER,"
FM 180 PRINT "{RIGHT}AIR-CORE I NDUCTOR USING ENAMEL WI RE."
HP 190 PRINT "{2 DOWN}{RIGHT}SE LECT: 1- INDUCTANCE UNK NOWN";
BJ 195 PRINT SPC(59)"2- {6 SPACES}CHR$(34)" {5 SPACES}KNOWN"
RQ 200 INPUT "{3 DOWN}{RIGHT}CH OICE:{2 SPACES}1 {3 LEFT}";AS
MB 210 IFAS<>"1"ANDAS<>"2"THEN 200
BM 220 IFAS="1"THEN260
KS 230 PRINT "{DOWN}{RIGHT}ENTE R THE VALUE OF INDUCTAN CE"
EH 240 INPUT "{12 RIGHT}(IN MIC ROHENRIES)";IN$
KG 250 GOTO390
MQ 260 REM * * CALCULATE INDUC TANCE REQUIRED*
BB 270 PRINT "{CLR}{5 RIGHT}"HD $
JA 280 PRINT "{DOWN}{RIGHT}DETE RMINE INDUCTANCE REQUIR ED:-"
QX 290 PRINT "{DOWN}{RIGHT}SELE CT 1-INDUCTANCE OF AN E XISTING COIL"
HF 300 PRINT "{8-RIGHT}2-INDUCT
```

```
ANCE OF A TUNED INDUCTO R"
MK 310 INPUT "{DOWN}{RIGHT}CHOI CE{2 SPACES}1{3 LEFT}"; BS:IFBS<>"1"ANDBS<>"2"TH EN310
QJ 320 IFBS="1"THEN400
GE 330 PRINT "{CLR}{5 RIGHT}"HD $
AP 340 INPUT "{DOWN}{2 RIGHT}EN TER FREQ. IN KHZ";FR$
HK 350 INPUT "{DOWN}{2 RIGHT}EN TER CAPACITANCE IN MMFD S";CAS$
QP 360 IN$=STR$(INT(100*25330* 10^6/(VAL(CAS)*VAL(FR$) ^2)+.5)/100)
MG 370 PRINT "{DOWN}{2 RIGHT}IN DUCTANCE REQUIRED IS:" PRIN T "{DOWN}{7 RIGHT}"I N$ " MICROHENRIES"
SM 380 GOSUB1310
EF 390 IN=VAL(IN$)
GD 400 REM * * CALCULATE INDUC TOR SIZE * *
JS 410 PRINT "{CLR}{6 RIGHT}"HD $:IFBS="2"ORAS="2"THEN4 30
RJ 420 PRINT "{2 DOWN}{RIGHT}FO R AN EXISTING INDUCTOR {SPACE}ENTER ALL":PRIN T "{RIGHT}PARAMETERS."GO TO440
RC 430 PRINT "{2 DOWN}{RIGHT}TO DETERMINE AN INDUCTOR {SPACE}SIZE ENTER":PRIN T "{RIGHT}ANY TWO PARAME TERS."
EC 440 FL=0:CO=5:RO=6:GOSUB127 0:PRINT "WIRE SIZE {3 SPACES}(AWG 8-40):"
CC 450 RO=8:GOSUB1270:PRINT "CO IL DIAMETER (INCHES):"
AX 460 RO=10:GOSUB1270:PRINT "C OIL LENGTH{3 SPACES}(IN CHES):"
PE 470 CO=30:RO=6:GOSUB1270:IN PUTGA$:GA=VAL(GA$):IFGA $=""THENFL=FL+1:GOTO490
FF 480 IFGA<8ORGA>40THENGOSUB1 300:GOTO440
XF 490 RO=8:GOSUB1270:INPUTCD$ :IFCD$=""THENFL=FL+1
HA 500 IFIN=0ANDFL=0THEN520
CF 510 RO=10:GOSUB1270:INPUTCL $:IFCL$=""THENFL=FL+1
FP 520 IFFLANDIN$=""THENGOSUB1 280:GOTO440
DP 530 IFFL>1THENPRINT "{RVS}RE QUIRE TWO PARAMETERS!": GOTO440
AC 540 IFIN$=""THEN580
FM 550 IFGA$=""THEN650
PF 560 IFCD$=""THEN720
XS 570 IFCL$=""THEN820
PJ 580 IN=INT(100*.2*VAL(CD$)^ 2*(TN(GA)*VAL(CD$))^2
HJ 585 IN=IN/((3*VAL(CD$))+ (9* VAL(CD$))+.5)
SX 590 IN=IN/100
QD 600 PRINT "{DOWN}AN INDUCTOR WITH THE ABOVE PARAMET ERS"
HJ 610 PRINT "{RIGHT}WILL HAVE {SPACE}AN INDUCTANCE OF :":PRINT "{DOWN}
```

```
{6 RIGHT}"IN"MICROHENRI ES"
SM 620 PRINT "{DOWN}{2 RIGHT}WI TH CLOSE SPACING OF"TN( GA)*VAL(CD$)"TURNS."
PM 630 GOTO1040
PJ 640 REM * * CALCULATE AWG# {SPACE}* * *
CJ 650 N=INT(10*SQR((3*VAL(CD$ )+9*VAL(CD$))*VAL(IN$)/ (.2*VAL(CD$)^2)+.5)/10
DH 660 FORI=8TO40:IFSGN(TN(I)< N/VAL(CD$))THENNEXT
HS 670 PRINT "{DOWN}{RIGHT}AN I NDUCTANCE OF"IN"MICROHE NRIES"
BM 680 PRINT "{RIGHT}WILL REQUI RE"N"TURNS."
AS 690 PRINT "{DOWN}AWG#"I"HAS" TN(I)"PER INCH, CLOSE S PACED"
SJ 700 PRINT "OR USE SMALLER AW G, LOOSELY SPACED."
MK 710 GA=I:GOTO1060
PE 720 REM * * CALCULATE DIAME TER * * *
AS 730 N1=TN(GA)*VAL(CD$)
PB 740 MF=N1^2*.2/IN
CQ 750 CD=INT(100*(3+SQR(9+4*M F*9*VAL(CD$)))/(2*MF)+. 5)/100:CD$=LEFT$(STR$(C D),5)
BB 760 PRINT "{DOWN}FOR AN INDU CTANCE OF "IN$ " MICROHE NRIES"
AP 770 PRINT "AND THE ABOVE PAR AMETERS, THE DIAMETER"
GK 780 PRINT "REQUIRED IS: {DOWN}"CD$ " INCHES."
CD 790 PRINT "{DOWN}{RIGHT}WITH "TN(GA)*VAL(CD$)"TURNS {SPACE}OVER "CL$ " INCH. ":CL=VAL(CD$):GOSUB1240
FD 800 PRINT "{DOWN}{RIGHT}TOLE RANCE "INT(1000*(L/VAL( IN$)-1)+.5)/100$ "
CK 810 GOTO1060
DK 820 REM * * CALCULATE LENGTH * *
CE 830 RO=12:CO=10:GOSUB1270:P RINT "{RVS}DOING THE CAL CULATION!":CO=1:GOSUB12 70
CJ 840 IFNNN(1)>FNPU(1)THEN94 0
MB 850 FORI=1TO4STEP.1
RD 860 IFSGN(FNNN(I)-FNPU(I))= -1THENDF=ABS(FNNN(I)-FN PU(I)):NEXT:GOTO980
ME 870 IFDF<ABS(FNNN(I)-FNPU(I ))THENI=-.1
DQ 880 PRINT "FOR AN INDUCTANCE OF "IN$ " MICROHENRIES"
KG 890 PRINT "{RIGHT}AND THE AB OVE PARAMETERS, COIL LE NGTH"
JD 900 PRINT "{RIGHT}REQUIRED I S:{DOWN}"I" INCHES,"N1 =INT(10*TN(GA)*I+.5)/10 :CD=VAL(CD$):CL=I
MM 910 GOSUB1240:PRINT "{DOWN} {8 RIGHT}WITH"N1"TURNS. "
JP 920 PRINT "{DOWN}{RIGHT}TOLE RANCE "INT(1000*(L/VAL(
```




PROGRAMS

<pre> IN\$)-1)+.5)/10"% AQ 930 PRINT"{DOWN}FOR BETTER {SPACE}ACCURACY TRY CUS TOM DESIGN":GOTO1060 GP 940 FORI=1TO.05STEP-.05 SX 950 IFSGN(FNNN(I)-FNPU(I))= 1THENDEF=FNNN(I)-FNPU(I) :NEXT:GOTO1010 AD 960 IFDF<ABS(FNNN(I)-FNPU(I)))THENI=I+.05 MC 970 I=INT(100*I+.5)/100:GOT 0880 GK 980 PRINT"FOR THESE PARAMET ERS THE LENGTH IS":PRIN T" GREATER THAN 4 INCHE S. "; HG 990 PRINT"TRY A LARGER":PRI NT" DIAMETER"; KQ 995 IFGA<40THENPRINT", AND/ OR SMALLER GA." DD 1000 GOSUB1310:GOTO400 AG 1010 PRINT"FOR THESE PARAME TERS THE LENGTH IS":PR INT" LESS THAN .05 INC HES. "; BM 1020 PRINT"TRY A SMALLER":P RINT" DIAMETER"; XK 1025 IFGA>8THENPRINT", AND/ OR LARGER GA." MA 1030 GOSUB1310:GOTO400 HK 1040 REM * * * CUSTOM * * * JM 1050 PRINT"{DOWN}FOR LOOSE {SPACE}SPACING OF FEWE R TURNS SELECT":PRINT" CUSTOM!" EJ 1060 PRINT"{DOWN}{RIGHT} {RVS}SHIFT{OFF} TO END </pre>	<pre> . . . {RVS}CTRL{OFF} C USTOM DESIGN" JF 1070 ONPEEK(653)GOTO1260,10 70,1070,1090 SH 1080 GOTO1070 FS 1090 PRINT"{CLR}{RIGHT} {RVS}CUSTOM{3 SPACES}" HDS BE 1100 PRINT"{DOWN}{RIGHT}AN {SPACE}INDUCTOR WITH:" EP 1110 PRINT"{DOWN}{2 RIGHT}# OF TURNS OF AWG#"GA SK 1120 PRINT"{DOWN}{2 RIGHT}C OIL DIAMETER OF ":PRIN T"{DOWN}{2 RIGHT}COIL {SPACE}LENGTH OF " HB 1130 CO=25:RO=4:GOSUB1270:I NPUTN1:RO=RO+2:GOSUB12 70:INPUTCD HC 1140 RO=RO+2:GOSUB1270:INPU TCL CF 1150 IFTN(GA+GC)*CL<N1THENG C=GC+1 AB 1160 IFTN(GA+GC-1)*CL=>N1TH ENGCGC=GC-1 BM 1170 IFN1>TN(GA)*CL+.0001TH ENPRINT"{DOWN}{RVS}MOR E TURNS/INCH!{OFF} - A WG# NOW"GA+GC BX 1180 CD=CD+INT(100*1/TN(GA) +.5)/100:L=INT(100*.2* CD↑2*N1↑2/(3*CD+9*CL)+ .5)/100 GG 1190 PRINT"{DOWN}{RIGHT}IND UCTANCE IS"L"UH" HA 1200 PRINT"{DOWN}{RIGHT}CHA NGE :"; </pre>	<pre> KQ 1210 PRINTINT(1000*(L/IN-1) +.5)/10"% RQ 1220 GOTO1060 EQ 1230 REM * CALCULATE L * * {SPACE}* DC 1240 CD=CD+INT(100*1/TN(GA) +.5)/100:L=INT(100*.2* CD↑2*N1↑2/(3*CD+9*CL)+ .5)/100 ES 1250 RETURN HS 1260 END CB 1270 POKE783,PEEK(783)AND25 4:POKE782,CO:POKE781,R O:SYS65520:RETURN SM 1280 PRINT"{RVS}WITH INDUCT ANCE UNKNOWN ALL PARAM ETERS{2 SPACES}":CO=16 :RO=PEEK(214) DK 1290 GOSUB1270:PRINT"{UP} {RVS}REQUIRED!":RETURN MQ 1300 PRINT"{RVS}WIRE GAUGE {SPACE}IS OUTSIDE RANG E! ":RETURN RP 1310 PRINT"{DOWN}{3 RIGHT} {RVS}SHIFT{OFF} TO CON TINUE!":WAIT653,1:RETU RN CD 1320 REM * * DATA STATEMENT S * * * DJ 1330 DATA7.6,8.6,9.6,10.7,1 2,13.5,15,16.8 SQ 1340 DATA18.9,21.2,23.6,26. 4,29.4,33.1,37,41.3 CM 1350 DATA46.3,51.7,58,64.9, 72.7,81.6,90.5,101 GQ 1360 DATA113,127,143,158,17 5,198,224,248,282 </pre>
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H E N N I N G V A H L E N K A M P

When working with *GEOS*, have you ever wanted to change just a small note in a file's info dialog box? How about changing its write-protect status? Until now, making these changes required booting *GEOS* (a 30-second wait), closing the boot disk, opening your work disk, finding the file, and finally opening its dialog box. Having to do all this turns a simple task into a tedious chore.

Using *geoInfo Editor* eliminates this hassle by allowing you to work outside the *GEOS* environment. It takes you directly to your *GEOS* file's info. In addition to editing notes and changing the write-protect status, this utility offers additional features, such as the ability to change a file's class and the date a file was modified. Plus, you can dump this information to your printer.

What makes *geoInfo Editor* even more useful is that it works on both the 64 and the 128 (40 or 80 columns) and with 1541, 1571, and 1581 disk drives. When you run the program, system configuration is automatic.

GEOINFO EDITOR

USE THIS TIMESAVING
UTILITY TO CHANGE
NOTES IN GEOS
DIALOG BOXES

Getting Started

The program is written entirely in BASIC. To prevent typing errors, use *The Automatic Proofreader* to type it in; see "Typing Aids" elsewhere in this section. When you've finished typing in the program, remember to save a copy of *geoInfo Editor*.

When you run *geoInfo Editor*, there will be a short pause before a window similar to *GEOS*'s info dialog box appears. To the left are information headings such as Filename, Disk, and so on. The space next to the headings is for file information. Below this window is a command line for entering information and displaying messages. The command line accepts most keyboard characters, including corrections made with the Del key.

The Menu Bar

The menu bar is next. It lists all the commands you can give the program. Insert a *GEOS* disk into your drive and press D to get a directory. As it is being displayed, you can press any key to make it pause; press any key again to make it continue. You also can press Q to quit the directory listing at any time.

The next menu item, C, lets you enter any valid disk command. Note that *geoInfo Editor* traps almost any error and identifies it with a message. Press Return to clear an error message and continue using the program.



PROGRAMS

Select R to read the information on a *GEOS* file. Just enter its name and press Return. Similarly, W writes, or saves, the information on the screen to the *GEOS* file. Before this command is executed, you're asked to confirm the save. Press Y to do it and any other key to abort the command. Press P to print the displayed information to any Commodore-compatible printer. Finally, Q quits the program and returns you to BASIC.

The Highlight Bar

After you've selected a file, you're ready to begin. Simply use the cursor keys to move the highlighted bar to the desired item and then press Return. File type, structure, and size cannot be changed. Doing so is unnecessary and could prevent the file from working correctly.

If you select Filename, Disk, Class, or Author, simply enter a new name. If you select Modified, enter the new date and time as MMDDYYHHMM (month, day, year, hour, minute). The new time must be in 24-hour format, where 1:00 p.m. is 13:00.

If you select Write Ptct (Write Protect), enter Y for *Yes* or N for *No*. If you select Memory, enter the new info as XXXXYYYYZZZZ (starting address, ending address, execution address of the file) in hexadecimal. Avoid this option unless you know what you're doing, since a wrong move here could cause a lot of trouble.

The final selection is Notes. Select it, and you'll be prompted for the number (1-4) of the line you wish to change. Next, enter new information on that line. Pressing Return with nothing on the command line deletes the selected line. The maximum number of characters that you can enter for all four lines combined is 95.

Wrapping It Up

All changeable items, except the actual four Notes lines, have an escape feature. In other words, if you select an item and decide not to make any changes, press Return without entering anything else on the command line. The previous information will remain. Furthermore, all selections have a maximum number of characters you can enter. So if you're typing and nothing else appears on the com-

mand line, you've reached the character limit.

One final note is in order. The *GEOS* character set doesn't correspond to the Commodore upper- and lowercase set. Therefore, uppercase *GEOS* characters result in lowercase Commodore characters and vice versa. Keep this in mind when you are typing in your changes.

GEOINFO EDITOR

```

XE 0 REM COPYRIGHT 1991 - COMP
    UTE PUBLICATIONS INTL LTD
    - ALL RIGHTS RESERVED
DB 5 REM BY HENNING VAHLENKAMP
RF 10 REM***SET-UP***
AB 20 IF PEEK(65534)=23 AND PE
    EK(215)=128 THEN40
AE 30 POKE53280,6:POKE53281,6:
    XX=3:TX=4:GOTO60
SG 40 POKE53265,11:POKE53296,1
    :SYS52684,3,26
DC 50 XX=23:XX$="{RIGHT}":TX=2
    4
SF 60 DN=8:T=18:OPEN1,DN,15
HE 70 PRINT#1,"M-R"CHR$(198)CH
    R$(229)CHR$(1)
BA 80 GET#1,BY$:IF ASC(BY$)=25
    5 THEN T=40:FL=1
SC 90 CLOSE1:DIM C$(16),T$(13)
    ,M$(15)
DH 100 FOR L=1 TO 32
QD 110 HB$=HB$+CHR$(192):S$=S$
    "+" :NEXT
MH 120 FOR L=. TO 10:READ CH$(
    L),LL(L):NEXT
ER 130 FOR L=. TO 16:READ C$(L)
    :NEXT
QF 140 FOR L=. TO 2:READ Q$(L)
    :NEXT
KQ 150 FOR L=1 TO 15:READ M$(L)
    :NEXT
JH 160 H$="-":Z$=CHR$(.) :SS$=C
    HRS(160):HM$="{HOME}"
BE 170 RT$="{RIGHT}":DN$="{
    {DOWN}":RS$="{RVS}"
MF 180 FOR L=1 TO XX:R$=R$+RT$
    :NEXT
PA 190 FOR L=1 TO 21:DM$=DM$+D
    N$:NEXT
KC 200 FOR L=. TO 5
AC 210 RT$=RT$+RT$+XX$:DN$=DN$
    +DN$:NEXT
DS 220 DN$=HM$+DN$:HX$="012345
    6789ABCDEF"
DP 230 REM***SCREEN***
BA 240 PRINTCHR$(14)" {CLR}
    {WHT}{DOWN}"RS="{A}"HB$"
    {S}"
SG 250 PRINTRSH$***"H$"
    {3 SPACES}"M$(1)"
    {3 SPACES}"H$***"H$
JF 260 PRINTRSH$Q$HB$W$
XK 270 FOR L=1 TO 10:PRINTRSH$
    S$H$:NEXT
CE 280 PRINTRSH$LEFT$(S$,9)LEF
    T$(HB$,23)"W$"
CM 290 FOR L=1 TO 4
DQ 300 PRINTRSH$8$L"CHR$(L+4
    8)"WHT"H$LEFT$(S$,29)
    H$:NEXT

```

```

EM 310 PRINTRSH$Z$E$LEFT$(
    HB$,29)"X$"
QG 320 PRINTRSH$HB$":PRINT:
    PRINTRSH$HB$
FX 330 PRINTRSH$8$M$(2):PRINT
    RSM$(3);
AH 340 REM***MAIN***
KC 350 PRINTHM$LEFT$(DN$,5);
BD 360 FOR L=. TO 10
MK 370 PRINTLEFT$(RT$,TX)"8$"
    CH$(L)"WHT":NEXT
SS 380 GOSUB1550
RJ 390 PRINTLEFT$(DN$,MC+5)LEF
    T$(RT$,TX)"8$R$LEFT$(
    CH$(MC),LEN(CH$(MC))-1
    )"WHT"
SQ 400 GET K$:IF K$="" THEN400
DD 410 IF K$=CHR$(13) THEN530
BF 420 IF K$="D" THEN740
FJ 430 IF K$="C" THEN860
AD 440 IF K$="R" THEN920
XQ 450 IF K$="W" THEN1630
RA 460 IF K$="P" THEN1970
SQ 470 IF K$="Q" THEN2370
HQ 480 IF K$="{DOWN}" THEN MC=
    MC+1:IF MC>10 THEN MC=
    IF K$="{UP}" THEN MC=MC
    -1:IF MC<. THEN MC=10
RD 500 PRINTLEFT$(DN$,M2+5)LEF
    T$(RT$,TX)"8$LEFT$(CH
    $(M2),LEN(CH$(M2))-1)"
    {WHT}"
KB 510 M2=MC:GOTO390
PP 520 REM***CHANGE***
QB 530 TM$=T$(MC):GOSUB2190
QR 540 IF T$(.)="" THEN PRINTM
    $(8):GOSUB2210:GOSUB220
    0:GOTO400
RS 550 IF MC<2 AND MC<>4 AND
    {SPACE}MC<>5 THEN LN=LL
    (MC):GOSUB2060
ES 560 ON MC+1 GOTO570,570,580
    ,570,580,580,590,570,62
    0,650,680
QA 570 T$(MC)=TX$:GOTO710
AQ 580 PRINTM$(9):GOSUB2210:GO
    SUB2200:GOTO400
SA 590 MM=VAL(MID$(TX$,1,2)):D
    D=VAL(MID$(TX$,3,2)):YY
    =VAL(MID$(TX$,5,2))
BJ 600 HH=VAL(MID$(TX$,7,2)):N
    N=VAL(MID$(TX$,9,2))
XQ 610 FG=1:GOSUB1340:GOTO710
BH 620 IF TX$="Y" THEN T$(8)="
    YES":WP=WP OR 64
SC 630 IF TX$="N" THEN T$(8)="
    NO":WP=WP AND 191
JQ 640 GOTO710
RG 650 AD$=TX$:T$(9)="" :Q=1:FO
    R L=. TO 2
AJ 660 T$(9)=T$(9)+Q$(L)+MID$(
    TX$,Q,4)
FK 670 Q=Q+4:NEXT:GOTO710
RG 680 X=VAL(TX$):IF X<1 OR X>
    4 THEN400
DH 690 LN=29:IF X=4 THEN LN=8
BJ 700 GOSUB2060:T$(9+X)=TX$:G
    OTO350
RS 710 IF TX$="" THEN T$(MC)=T
    M$:GOTO400
JA 720 GOTO350
AM 730 REM***DIRECTORY***
RS 740 PRINT"{CLR}":X=11:Y=12
EM 750 OPEN1,DN,,"$0":GET#1,V
    1$

```




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GH 760 GET#1,V1\$,V1\$,V1\$,V1\$,V 2\$,V3\$	SD 1230 FOR L=1 TO 187:GET#2,B Y\$:IF BY\$="" THEN BY\$= Z\$	DM 1650 IF K\$<>"Y" THEN1950
RP 770 PRINTASC(V1\$+Z\$)+ASC(V2 \$+Z\$)*256V3\$;	QS 1240 S2\$=S2\$+BY\$:NEXT:CLOSE 2:CLOSE1	SX 1660 GOSUB2190:PRINT M\$(7): FOR L=. TO 5:TT\$(L)="" :NEXT
AC 780 FOR L=. TO X	CG 1250 TS(.)=TX\$:TS(2)=C\$(ASC (MID\$(S1\$,23,1)))	MB 1670 FOR I=. TO 1
PF 790 GET#1,V1\$,V2\$:PRINTV1\$V 2\$;:NEXT	CS 1260 FOR L=10 TO 27	BG 1680 X=LEN(T\$(I)):TT\$(I)=T\$(I)
XX 800 GET K\$:IF K\$="Q" THEN83 0	FG 1270 BY\$=MID\$(S2\$,L,1):IF B Y\$=Z\$ THEN1290	GP 1690 IF X<16 THEN FOR J=1 T O 16-X:TT\$(I)=TT\$(I)+S S\$:NEXT J
KS 810 IF K\$<>" " THEN GOSUB221 0	JG 1280 TS(3)=TS(3)+BY\$:NEXT	DE 1700 NEXT I
XJ 820 PRINT:IF V2\$<>" " THEN X =Y:GOTO760	HK 1290 TS(4)=C\$(ASC(MID\$(S1\$, 22,1))+15)	BF 1710 L=2:FOR I=3 TO 7 STEP {SPACE}4
MX 830 CLOSE1	GA 1300 X=ASC(MID\$(S1\$,29,1))+ ASC(MID\$(S1\$,30,1))*25 6	HA 1720 X=LEN(T\$(I)):TT\$(L)=T\$(I)
SQ 840 PRINT:PRINT M\$(10):GOSU B2210:GOTO240	XQ 1310 TS(5)=STR\$(INT(X/4))+ K{2 SPACES}"+STR\$(X)+" BLOCKS"	CE 1730 IF X<18 THEN FOR J=1 T O 18-X:TT\$(L)=TT\$(L)+Z \$:NEXT J
SF 850 REM***DISK COMMAND***	KA 1320 MM=ASC(MID\$(S1\$,25,1)) :DD=ASC(MID\$(S1\$,26,1)) :YY=ASC(MID\$(S1\$,24,1))	QR 1740 L=3:NEXT I
JX 860 LN=33:GOSUB2060:IF TX\$= "" THEN900	EE 1330 HH=ASC(MID\$(S1\$,27,1)) :NN=ASC(MID\$(S1\$,28,1))	KJ 1750 DT\$=CHR\$(YY)+CHR\$(MM)+ CHR\$(DD)+CHR\$(HH)+CHR\$(NN)
EH 870 OPEN1,DN,15:PRINT#1,TS\$	GB 1340 TS(6)=STR\$(MM)+"/"+STR \$(DD)+"/"+STR\$(YY)	QJ 1760 FOR L=1 TO 9 STEP 4
MF 880 INPUT#1,EN,EM\$,ET,ES:GO SUB2190	PS 1350 X\$=STR\$(NN):IF LEN(X\$) =2 THEN X\$=" "0"+RIGHTS (X\$,1)	SM 1770 X\$=MID\$(AD\$,L,4):GOSUB 2290
CK 890 PRINTEN;EM\$;ET;ES:GOSUB 2210	JX 1360 TS(6)=TS(6)+" "+STR\$(H H)+": "+X\$	QH 1780 HI=INT(X/256):LO=X-HI* 256
FB 900 CLOSE1:GOSUB2200:GOTO40 0	AH 1370 IF FG THEN FG=:RETURN	HX 1790 TT\$(4)=TT\$(4)+CHR\$(LO) +CHR\$(HI):NEXT
PC 910 REM***READ & DECODE***	DF 1380 FOR L=30 TO 47	BD 1800 FOR L=10 TO 13:TT\$(5)= TT\$(5)+T\$(L):NEXT
DQ 920 FI\$="":LN=16:S=1:IF FL {SPACE}THEN S=3	FQ 1390 BY\$=MID\$(S2\$,L,1):IF B Y\$=Z\$ THEN1410	CJ 1810 X=LEN(TT\$(5))
GG 930 GOSUB2060:IF TX\$="" THE N400	QM 1400 TS(7)=TS(7)+BY\$:NEXT	DC 1820 IF X<95 THEN FOR L=1 T O 95-X:TT\$(5)=TT\$(5)+Z \$:NEXT
GG 940 GOSUB2190:PRINTM\$(6)	GB 1410 WP=ASC(LEFT\$(S1\$,1))	ED 1830 S1\$=CHR\$(WP)+MID\$(S1\$, 2,2)+TT\$(.)+MID\$(S1\$,2 0,4)+DT\$+MID\$(S1\$,29,2)
KR 950 OPEN1,DN,15,"I0":OPEN2, DN,2,"#"	DK 1420 IF WP>133 THEN TS(8)=" YES":GOTO1440	CF 1840 TM\$=CHR\$(WP)+MID\$(S2\$, 2,2)+TT\$(4)+TT\$(2)+MID \$(S1\$,28,2)
MD 960 PRINT#1,"U1";2;.:T;S	HP 1430 TS(8)="NO"	AB 1850 S2\$=TM\$+TT\$(3)+MID\$(S2 \$,48,45)+TT\$(5)
CG 970 GET#2,TR\$,SE\$:TR\$=TR\$+Z \$:SE\$=SE\$+Z\$	PE 1440 Q=2:FOR L=2 TO 6 STEP {SPACE}2	DB 1860 OPEN1,DN,15,"I0":OPEN2 ,DN,2,"#"
AR 980 FOR VL=5 TO 244 STEP 32	BX 1450 X=ASC(MID\$(S2\$,L+2,1)) +ASC(MID\$(S2\$,L+3,1))* 256	AC 1870 PRINT#1,"U1";2;.:T;SS: PRINT#1,"B-P";2;VL-3
ME 990 PRINT#1,"B-P";2;VL	SS 1460 GOSUB2240:AD\$=AD\$+A\$:T \$(9)=T\$(9)+Q\$(L-Q)+A\$	PR 1880 PRINT#2,S1\$:PRINT#1," U2";2;.:T;SS
KK 1000 FOR I=1 TO 16:GET#2,BY \$	AR 1470 Q=Q+1:NEXT	HB 1890 CLOSE2:CLOSE1:OPEN1,DN ,15,"I0":OPEN2,DN,2,"# "
DK 1010 IF BY\$=SS\$ THEN1030	RX 1480 X=93:FOR I=10 TO 13	QB 1900 PRINT#1,"U1";2;.:T;.:P RINT#1,"B-P";2;KK
DX 1020 FI\$=FI\$+BY\$:NEXT I	JX 1490 FOR L=X TO X+28	QG 1910 PRINT#2,TT\$(1);:PRINT# 1,"U2";2;.:T;.
FD 1030 IF FI\$=TX\$ THEN1080	XJ 1500 BY\$=MID\$(S2\$,L,1):IF B Y\$=Z\$ THEN1530	CA 1920 CLOSE2:CLOSE1:OPEN1,DN ,15,"I0":OPEN2,DN,2,"# "
GG 1040 FI\$="":NEXT VL	DB 1510 TS(I)=TS(I)+BY\$	EF 1930 PRINT#1,"U1";2;.:TK;SK :PRINT#1,"B-P";2;68
JK 1050 IF ASC(TR\$)<. THEN S= ASC(SE\$):GOTO960	PD 1520 NEXT L:X=X+29:NEXT I	EB 1940 PRINT#2,S2\$:PRINT#1," U2";2;.:TK;SK
BP 1060 GOSUB2200:GOSUB2190:PR INTM\$(5)	SB 1530 CLOSE2:CLOSE1:GOSUB220 0:GOTO380	JR 1950 CLOSE2:CLOSE1:GOSUB220 0:GOTO400
DP 1070 GOSUB2210:GOTO1530	GB 1540 REM***UPDATE SCREEN***	SA 1960 REM***PRINTER DUMP***
SJ 1080 ZZ\$=S1\$:S1\$="":PRINT#1 ,,"B-P";2;VL-3	SJ 1550 PRINTM\$(3 DOWN)"	QH 1970 GOSUB2190
EP 1090 FOR L=1 TO 30	XA 1560 FOR L=. TO 9	BQ 1980 IF T\$(.)="" THEN PRINT M\$(11):GOSUB2210:GOTO2 040
QE 1100 GET#2,BY\$:IF BY\$="" TH EN BY\$=Z\$	CD 1570 PRINTTAB(TX+10)T\$(L)LE FT\$(S\$,21-LEN(T\$(L)))	FH 1990 OPEN4,4,7:CLOSE4:IF ST <>0 THEN PRINTM\$(14):G OSUB2210:GOTO2040
XH 1110 IF L=20 AND BY\$=Z\$ THE N S1\$=ZZ\$:GOSUB2190:PR INTM\$(15):GOSUB2210:GO TO1530	AC 1580 NEXT:PRINT	GC 2000 PRINTM\$(4):OPEN4,4,7
CF 1120 S1\$=S1\$+BY\$:NEXT	QS 1590 FOR L=10 TO 13	
QG 1130 S2\$="":AD\$="":SS=S	SE 1600 PRINTTAB(TX+3)T\$(L)LEF T\$(S\$,29-LEN(T\$(L)))	
AK 1140 FOR L=. TO 13:T\$(L)="" :NEXT	DQ 1610 NEXT:RETURN	
QF 1150 KK=144:IF FL THEN KK=4	KS 1620 REM***ENCODE & WRITE** *	
QX 1160 PRINT#1,"U1";2;.:T;.:P RINT#1,"B-P";2;KK	DF 1630 GOSUB2190:IF T\$(.)="" {SPACE}THEN PRINTM\$(12):GOSUB2210:GOSUB2200: GOTO400	
XC 1170 FOR L=1 TO 16	KR 1640 PRINTM\$(13):GOSUB2210	
GJ 1180 GET#2,BY\$:IF BY\$=SS\$ T HEN1200		
QS 1190 TS(1)=TS(1)+BY\$:NEXT		
KH 1200 TK=ASC(MID\$(S1\$,20,1)) :SK=ASC(MID\$(S1\$,21,1))		
HJ 1210 PRINT#1,"U1";2;.:TK;SK		
ED 1220 PRINT#1,"B-P";2;68		



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HD 2010 FOR L=. TO 9:PRINT#4,C
HS(L)TS(L):NEXT
RB 2020 PRINT#4:FOR L=10 TO 13
JX 2030 PRINT#4,"L"CHR$(L+39)"
:"TS(L):NEXT:CLOSE4
XF 2040 GOSUB2200:GOTO400
AC 2050 REM***COMMAND LINE***
SG 2060 TX$="":GOSUB2190
AA 2070 GET K$:V=ASC(K$+Z$)
GH 2080 IF (V>31 AND V<96) OR
{SPACE}(V>192 AND V<21
9) OR V=20 THEN2110
HQ 2090 IF V=13 THEN2170
CE 2100 GOTO2070
AB 2110 IF TX$="" AND V=20 THE
N2070
XD 2120 IF LEN(TX$)>=LN AND V<
>20 THEN2070
AE 2130 PRINTK$;
KB 2140 IF V>192 THEN K$=CHR$(
V-96)
RB 2150 IF V<20 THEN TX$=TX$+
K$:GOTO2070
FC 2160 TX$=LEFT$(TX$,LEN(TX$)
-1):GOTO2070
SX 2170 GOSUB2200:RETURN
RG 2180 REM***SET, CLEAR, WAIT
***
RX 2190 PRINTH$MSR$":":RETU
RN
CJ 2200 PRINTH$MSR$SS$
{4 SPACES}"HMS":RETURN
KM 2210 GET K$:IF K$="" THEN22
10
MM 2220 RETURN
GH 2230 REM***DEC-HEX, HEX-DEC

```

```

***
CR 2240 AS$="":Z=1:FOR I=1 TO 3
EE 2250 V=INT(X/(4096/Z)):AS=A
$+MID$(HX$,V+1,1)
EQ 2260 X=INT(X-V*(4096/Z))
SC 2270 Z=Z*16:NEXT
KD 2280 AS=AS+MID$(HX$,X+1,1):
RETURN
HX 2290 AS$="":X=.:FOR I=1 TO 4
KK 2300 AS=MID$(X$,5-I,1)
EM 2310 FOR J=1 TO 16
HA 2320 IF AS=MID$(HX$,J,1) TH
EN2340
EQ 2330 NEXT J
AS 2340 X=X+(16*(I-1))*(J-1):N
EXT I:IF X>65535 THEN
{SPACE}X=.
GC 2350 RETURN
PP 2360 REM***QUIT***
AA 2370 CLOSE2:CLOSE1:PRINT"
{CLR}"CHR$(142):END
XF 2380 DATA"FILENAME:",16,"
{5 SPACES}DISK:",16,"
{5 SPACES}TYPE:",1,"
QC 2390 DATA"{4 SPACES}CLASS:"
,18,"STRUCTURE:",1,"
{5 SPACES}SIZE:",1,"
JE 2400 DATA"MODIFIED:",10,"
{3 SPACES}AUTHOR:",18
RJ 2410 DATA"WRITE PTCT:",1,"
{3 SPACES}MEMORY:",12,"
{4 SPACES}NOTES:",1
XX 2420 DATA"CBM PRG","BASIC P
RG","ASSEMBLY PRG"
JC 2430 DATA"DATA FILE","SYSTE
M FILE","DESK ACCESSOR

```

```

Y"
FA 2440 DATA"APPLICATION","APP
LICATION DATA","FONT F
ILE"
PA 2450 DATA"PRINTER DRIVER","
INPUT DRIVER","DISK DR
IVER"
PP 2460 DATA"SYSTEM BOOT FILE"
,"TEMP","AUTO-EXEC"
DP 2470 DATA"SEQUENTIAL","VLIR
"
BH 2480 DATA"$","-$","EXA:$"
HA 2490 DATA"-->GEOINFO EDITOR
<--","{RVS}D{OFF}:DIR
ECTORY {RVS}C{OFF}:DIS
K CMD{4 SPACES}{RVS}Q
{OFF}:QUIT"
PR 2500 DATA" {RVS}R{OFF}:READ
{RVS}W{OFF}:WRITE
{RVS}P{OFF}:PRINT","PR
INTING..."
XC 2510 DATA"FILE NOT FOUND.",
"READING & DECODING..."
,"ENCODING & WRITING.
..."
XJ 2520 DATA"NO FILE SELECTED.
","THIS CAN'T BE CHANG
ED.", "PRESS ANY KEY."
PS 2530 DATA"NOTHING TO PRINT.
","NOTHING TO WRITE.",
"ARE YOU SURE (Y/N)?"
MC 2540 DATA"PRINTER NOT READY
.", "INPUT NOT A GEOS F
ILE."

```

K E V I N D I X O N

The evil Gorn system has established a secret base in your galaxy and plans to launch a major attack. Your mission is to find the enemy base and destroy it.

Finding the enemy base will not be easy. It has a cloaking device that makes it invisible to your ship's scanners, and its shield protects it from your fire. Its only weak points are the four generators that supply its power. If you can disable these generators and render the base visible, you can destroy it and stop the Gorn invasion.

Star Strike is a one-player game that requires quick reflexes and a good memory. It also takes some patience.

Getting Started

Star Strike is written entirely in machine language, but it loads and runs like a BASIC program. Enter the program with *MLX*, our machine language entry program; see "Typing Aids" elsewhere in this section. When *MLX* prompts you, respond with the values given below.

Starting address: 0801
Ending address: 1808

STAR STRIKE

BEFORE YOU CAN
ATTACK AN ENEMY
SPACE STATION, YOU
MUST FIRST DISABLE
THE GENERATORS
THAT POWER ITS
CLOAKING DEVICE IN
THIS ARCADE-STYLE
GAME FOR THE 64

When the title screen appears, plug a joystick into port 1 and press the fire button. You'll see your mother ship in the middle of the screen with your ship docked alongside. You'll find your score at the top of the screen, along with the number of lives you have remaining, the amount of energy you have, the sector you are in, and the number of generators you have destroyed. You'll always start in sector 11 with 2500 units of energy and four spare lives.

To maneuver your ship, use the joystick. Push left and right to rotate your ship. Push forward to thrust in the direction it's pointing. Press the fire button to launch a photon blaster. Pull back on the stick to activate your hyperspace device to jump to another sector. As you fly around the galaxy, your energy decreases. Firing the photon blaster uses one energy unit. Using hyperspace depletes 100 energy units.

When you move off the edge of the screen, you'll move into an adjacent sector. There are 64 sectors in the galaxy, arranged in an 8 x 8 grid. The first number in the sector indicator is

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the x location, and the second is the y location, so sector 11 is the first sector, and 88 is the last.

As you explore the area, you'll see quite a few asteroids in different sectors. These asteroids have gravity, and if you are not careful, they'll pull your ship in, and you'll be destroyed. Colliding with an asteroid decreases your overall energy supply rather quickly. If you are lucky, you can hit an asteroid and survive, but your energy will be very low.

Your mother ship also has gravity. When you wish to dock with it to replenish your energy, return to sector 11 and fly close to the gray landing pad. When you approach the pad, slow down and let the mother ship's tractor beam pull you in. When you are docked, your energy will be resupplied to 2500 energy units. Whenever your ship is docked, it is protected by the mother ship's shields.

Before you can destroy the enemy base, you must find the four generators that are supplying power to the base's cloaking device and shields. The generators are hidden inside four asteroids somewhere in the galaxy.

You must search the galaxy, firing your photon blaster at asteroids. An asteroid must be hit about 30 times before it will explode. If a generator is hidden inside, it will appear after the asteroid disintegrates. Generators look like large red diamonds, and you must hit them about 30 times before they will explode. After a generator has been destroyed, one of the Xs in the upper right corner of the screen will become reversed, indicating that you have one less generator to find and destroy.

As you search for generators, the enemy base launches homing robot missiles at you. You'll hear an alarm from your ship's sensors whenever a missile is launched. Missiles track your movement and follow you, no matter where you go in the galaxy. You can't outrun these missiles, but you can outmaneuver them. If a missile hits you, you lose 500 units of energy. You can destroy missiles if you hit them with four shots of your photon blaster, and they're also vulnerable to collisions with an asteroid or your mother ship.

When a missile enters your sector, pay attention to what direction it came from. The enemy Gorn base is

in that direction. Sometimes you can locate the base before all four generators are destroyed. If a missile suddenly appears in your sector and your launch alarm goes off simultaneously, you'll know that the enemy base is in that sector, even though you can't see or hit it. Remember the sector number, because the base will be there when you have destroyed all four generators and made it vulnerable.

Once you have destroyed all four generators and have located the base, start attacking it. Its shields will be down, but it can now launch missiles more frequently. The base has to be hit about 200 times with your blaster before it can be destroyed, so be prepared to return to your mother ship for energy. You'll probably find it necessary to return several times during a game, as missiles sap your energy.

If you manage to destroy the base, head back to your mother ship and dock. You'll receive bonus points for the number of lives you have remaining.

If you find yourself in trouble—for example, you're heading straight for an asteroid or you're surrounded by missiles—you can escape by using your hyperspace device. Use the hyperspace sparingly, however, as it costs 100 units of energy. Also, you may find yourself landing right on top of a deadly asteroid.

If you wish to pause the game at any time, press Run/Stop. Press any other key to resume play.

STAR STRIKE

```
0801:0B 08 70 17 9E 32 34 30 6E
0809:37 00 00 00 20 20 20 96
0811:20 20 20 20 20 A0 C4 B9 06
0819:3C 08 99 F8 00 B9 FD 08 F6
0821:99 33 03 88 D0 F1 A0 09 4C
0829:B9 0C 08 99 FF 03 88 D0 A1
0831:F7 A9 3C 85 2D A9 1F 85 5B
0839:2E 4C 00 01 11 EA 04 3C FB
0841:1F 81 16 B9 6E 09 99 E8 53
0849:07 C8 D0 F7 EE 02 01 EE 19
0851:05 01 C6 F9 D0 ED A2 03 23
0859:20 34 03 F0 33 C9 07 D0 95
0861:16 A2 01 20 34 03 D0 A0 A0
0869:A2 04 20 34 03 18 69 07 65
0871:10 05 A2 0A 20 34 03 85 1D
0879:A8 A5 A7 85 A9 A5 FE 85 FB
0881:F7 A5 FE 85 F8 20 6C 03 73
0889:A5 F8 85 FF A5 F7 85 FE 72
0891:E8 20 34 03 D0 1E A2 08 21
0899:20 34 03 A0 02 84 A8 85 2A
08A1:A6 18 A5 FC 65 A6 85 F7 58
08A9:A5 FD 65 A7 85 F8 20 6C EF
08B1:03 4C 13 01 E8 20 34 03 FB
08B9:D0 1C A0 03 84 A8 E8 20 36
```

```
08C1:34 03 F0 08 A2 08 20 34 F4
08C9:03 4C 5C 01 A2 0F 20 34 CF
08D1:03 E6 A7 4C 5C 01 E8 20 AF
08D9:34 03 D0 0A E8 20 34 03 B2
08E1:18 69 04 A8 D0 D6 E8 20 37
08E9:34 03 D0 0A A2 02 20 34 21
08F1:03 18 69 06 D0 ED A2 08 A2
08F9:20 34 03 D0 E6 A9 00 85 F7
0901:A7 A4 FB F0 0C 06 FA 2A 37
0909:26 A7 C6 FB CA D0 F2 A8 D8
0911:60 48 B1 FE 85 FA A9 08 FE
0919:85 FB 68 A4 FE D0 02 C6 4A
0921:FF C6 FE C0 E7 D0 DE A4 B5
0929:FF C0 07 D0 D8 A9 37 85 BA
0931:01 58 4C 00 0E A4 A8 F0 A8
0939:22 A5 F7 38 E5 A8 B0 03 7E
0941:C6 F8 38 85 F7 A5 FC E5 8A
0949:A8 B0 02 C6 FD 85 FC B1 3A
0951:F7 88 91 FC 98 D0 F8 C4 42
0959:A9 F0 0A B1 F7 C6 FD C6 76
0961:F8 C6 A9 10 EC 60 78 E6 98
0969:01 4C 16 08 60 20 08 0A EF
0971:00 9E 33 35 38 34 20 22 D9
0979:0E 5E 4B 60 C0 B0 44 49 9D
0981:58 91 20 BA E1 05 8D 10 22
0989:78 08 F1 38 A8 63 20 23 D1
0991:66 66 80 7E 0C 60 78 E6 98
0999:34 42 C0 5F FC 06 C0 57 3D
09A1:7C 22 05 C4 72 C1 53 FC A5
09A9:07 30 84 BE 3C F4 08 18 A5
09B1:10 05 82 00 0E 21 00 C1 14
09B9:53 CC 07 88 FE 2D 06 9F 6A
09C1:1F 00 1C 3F C5 5F 80 C8 50
09C9:0B 10 33 00 A2 2D 04 0B 0B
09D1:54 F0 F9 48 14 0B 01 E2 BF
09D9:A7 E0 07 C0 01 F0 80 A3 CD
09E1:A7 CA 21 47 A2 58 28 0A E3
09E9:01 84 50 91 07 20 E6 00 47
09F1:44 1B 80 D0 A9 F2 90 79 BD
09F9:28 10 00 70 FC 17 3C 05 AD
0A01:7C A1 B3 E5 20 13 59 2C BC
0A09:16 85 C5 5F 91 57 F4 04 10
0A11:C0 58 7C 1E 8A 85 A2 00 5D
0A19:7C C9 DF F8 01 80 4C F9 06
0A21:48 C4 21 04 20 78 8A 9F 86
0A29:02 B6 04 E1 C9 F2 F7 79 0E
0A31:70 68 84 E2 C8 07 81 1C D7
0A39:E6 E7 CB 4C 07 18 40 2C 3E
0A41:3C 34 02 3E F2 B3 38 F3 6F
0A49:F3 E5 AC 23 50 08 00 E0 1C
0A51:F8 2F 7E 33 9A 9F 2F 85 E7
0A59:03 AF 85 0F 1D 01 E0 3F 6A
0A61:69 04 07 E4 E7 CB 5D E7 6B
0A69:A1 03 11 DA 7F F9 D9 E0 57
0A71:29 F4 B6 0A 7C 24 E2 3F 48
0A79:80 00 1F 14 0E 10 9B E8 E2
0A81:9D 9C 2C A9 1F 86 38 0A 39
0A89:1E 1A A1 32 8F 81 B0 E6 55
0A91:A1 58 28 0A EA C0 2A D3 B4
0A99:0C 9C 3A 80 97 5C 0F 05 7B
0AA1:00 A3 06 5E 8A 94 62 A4 55
0AA9:E8 28 2E 8A 88 62 A1 28 E3
0AB1:9A 9A 98 9A FE 98 1B FF 0B
0AB9:90 1F 57 D0 FD 55 FC F5 0B
0AC1:A9 7C 3E AA F0 0F AB E8 40
0AC9:05 AF EF 2E 02 60 04 D8 9F
0AD1:C6 8D 4C C1 92 61 52 80 91
0AD9:14 1A 05 05 38 14 08 85 17
0AE1:40 5F 05 5C 2A A5 5C 0B 1B
0AE9:A9 5C 2E 2A A0 3B 3D F0 AF
0AF1:2E 06 40 3B 02 00 2E DF A6
0AF9:05 3B 64 F1 C2 88 00 FC 40
0B01:00 07 96 00 19 69 C0 3E D9
0B09:99 40 5B A9 50 57 D9 F0 86
0B11:69 A7 F0 F5 6A 7C EA A6 05
0B19:68 FB 66 7B F0 4E 55 58 AA
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PROGRAMS

0B21:1F	79	DD	3E	55	95	07	AE	82	0D81:E0	02	44	43	C6	43	10	F3	A0	0FE1:D7	02	42	1B	82	35	64	A6	BE
0B29:95	0E	E9	66	01	DD	76	00	9D	0D89:CE	D0	3C	14	2B	C9	CD	05	29	0FE9:50	28	2E	64	9A	0B	69	14	2E
0B31:BF	5F	00	DE	EC	00	0F	BC	2F	0D91:50	43	1A	08	EE	C8	07	CC	DD	0FF1:52	25	C8	10	63	26	C0	48	1A
0B39:00	02	D8	3A	78	9F	7B	86	4E	0D99:19	5E	0E	CE	F0	04	AD	34	AD	0FF9:2C	97	0F	06	20	81	13	4C	CF
0B41:60	00	3F	50	02	E5	9C	03	58	0DA1:E8	0C	80	C1	A0	1B	CE	68	D6	1001:57	14	E0	F2	02	28	29	20	40
0B49:5E	B4	06	59	BB	09	B6	7B	FC	0DA9:06	D0	46	A9	03	8D	3B	DC	FF	1009:D0	0A	79	DD	05	14	AD	3E	33
0B51:0A	BA	57	36	59	E5	3D	5D	A3	0DB1:06	0E	0A	60	00	E2	51	B3		1011:80	80	90	91	07	BF	D0	18	AD
0B59:5D	16	77	6D	DE	57	59	D6	47	0DB9:07	03	78	CB	90	06	A7	42		1019:69	12	D8	2E	20	18	00	80	52
0B61:7A	DF	DD	EA	64	DD	E7	64	E5	0DC1:8A	C0	FA	71	18	B9	01	60	D1	1021:38	0C	00	82	F3	40	5C	0E	EF
0B69:BF	75	B4	2D	56	70	3E	B9	D0	0DC9:B1	25	80	18	C9	00	06	03	F4	1029:60	74	58	36	09	80	99	00	82
0B71:E0	05	A5	80	0D	5E	8B	0D	FB	0DD1:94	80	4B	9D	00	09	90	04	E2	1031:3C	2B	EB	76	20	11	F0	F9	40
0B79:1F	D5	22	04	B0	00	CA	86	BA	0DD9:2F	64	80	21	31	C0	8D	C1	30	1039:8D	7A	1F	B0	00	B7	04	0D	A1
0B81:D2	E2	11	51	2C	40	41	0D	E2	0DE1:61	C8	A1	C3	E0	60	D6	07	8C	1041:17	80	D0	F6	A0	00	0F	0F	A6
0B89:A9	C0	03	67	2B	DC	20	02	8A	0DE9:65	BE	80	02	10	5D	DE	99	E3	1049:10	12	06	F0	F8	4A	A3	29	27
0B91:30	C2	F1	E2	4C	59	1C	07	E3	0DF1:00	8E	04	E2	24	C3	23	02	D6	1051:77	F0	F1	40	FE	12	EC	AA	70
0B99:A9	33	E5	31	B1	E1	21	50	C8	0DF9:4E	8A	7A	4C	59	3A	B9	43	5C	1059:BD	F0	42	06	E6	A9	3F	1C	B5
0BA1:04	01	C8	3F	48	9C	78	20	CC	0E01:1C	4E	04	1A	63	58	42	14	FF	1061:42	C0	04	B0	57	BF	9D	80	D3
0BA9:DC	51	3C	87	6E	06	02	07	19	0E09:F0	21	70	11	67	3B	11	B0	FF	1069:90	C8	C0	21	D0	D3	47	7C	0F
0BB1:05	03	08	01	04	FF	F9	FD	2E	0E11:15	20	79	3C	4C	81	E4	90	75	1071:0A	4A	07	04	3D	A0	0E	03	D5
0BB9:F8	FA	FC	F7	FE	FB	D5	33	F0	0E19:A8	B9	70	0E	DD	9B	90	03	68	1079:4C	35	15	CE	58	03	10	A9	35
0BC1:EF	DF	BF	05	13	95	22	43	86	0E21:20	62	67	85	01	EC	0A	09	04	1081:28	8D	04	C4	13	68	CB	80	38
0BC9:A2	CC	49	46	45	44	20	C5	33	0E29:9D	16	38	9D	3A	D0	2A	FB	DF	1089:2F	10	84	03	0D	72	00	06	3E
0BD1:4E	B0	10	47	59	5A	28	12	48	0E31:74	EA	E0	C9	F0	C7	E1	C9	2F	1091:43	06	39	80	D8	24	4C	16	0A
0BD9:D3	45	43	54	4F	52	3A	1D	2E	0E39:38	E9	E2	A9	F4	87	27	DE	D5	1099:50	61	30	0C	80	03	91	40	74
0BE1:1D	20	58	58	58	9D	94	58	D9	0E41:1E	9E	3B	B4	07	84	C4	80	1B	10A1:AC	0D	E0	F0	17	B0	13	82	AA
0BE9:00	C7	41	4D	45	20	4F	56	8E	0E49:2C	A9	9A	F0	C9	70	6F	2A	61	10A9:61	80	0E	8E	22	81	50	80	7D
0BF1:45	52	AA	C1	9F	C3	88	47	15	0E51:0E	01	30	27	4C	8C	50	25	87	10B1:62	00	1C	79	04	02	29	A3	3C
0BF9:52	02	0D	55	4C	41	54	A0	61	0E59:50	18	69	10	60	D2	04	C2	EA	10B9:B8	41	AD	5F	B3	1A	40	E0	99
0C01:42	53	21	C5	CD	21	0D	53	EF	0E61:2A	3A	47	A0	C4	01	E6	12		10C1:60	06	20	A0	1B	AD	06	D8	16
0C09:49	A4	20	41	43	43	4F	4D	1A	0E69:58	75	F0	11	78	41	D0	40	E8	10C9:79	88	00	6E	0A	40	F0	56	67
0C11:50	4C	49	53	48	45	44	21	C3	0E71:54	83	4C	54	77	61	18	ED	C6	10D1:06	8D	8C	11	B8	00	08	0B	AD
0C19:00	05	22	BD	C1	D2	20	20	4C	0E79:80	00	56	1D	5A	19	5B	3E	D2	10D9:B4	3E	EB	4C	76	15	13	AB	FF
0C21:D3	D4	D2	C9	CB	C5	00	42	07	0E81:5A	19	2F	DE	F1	68	C5	50	F1	10E1:63	B5	60	2C	8A	33	3E	0A	97
0C29:59	20	CB	45	56	49	4E	20	58	0E89:A3	15	DE	8F	56	1C	48	85	CA	10E9:0A	A8	A2	00	B9	40	0F	F0	6B
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0C41:09	05	09	00	80	14	00	51	E5	0EA1:12	A0	5E	06	04	9E	80	2F	E5	1101:81	04	BB	15	4A	C9	68	16	0E
0C49:28	14	06	20	F7	FB	F7	00	DC	0EA9:51	15	60	84	1F	C9	07	D0	07	1109:06	20	0F	16	4C	B4	15	C8	A1
0C51:F7	05	C0	01	F7	09	FB	36	0E	0EB1:0C	38	70	8F	FD	E4	86	40	B9	1111:E8	E0	04	D0	CD	98	BF	C4	82
0C59:18	D0	1C	64	0C	14	12	00	50	0EB9:CC	05	04	12	28	8A	01	C6	53	1119:81	57	BC	18	34	2F	75	C4	F8
0C61:00	F4	20	89	3C	90	04	20	9F	0EC1:0E	80	10	D0	FE	23	DC	21	73	1121:6C	40	15	14	CE	12	33	F4	87
0C69:00	10	84	10	B9	10	42	10	B9	0EC9:18	E8	1C	11	88	19	05	FE	72	1129:0F	C5	EE	4E	4C	71	02	D0	04
0C71:E3	3C	00	02	60	20	00	27	55	0ED1:00	D0	87	27	20	04	10	98	4F	1131:F0	41	82	84	50	86	63	AD	C5
0C79:00	04	02	01	68	A0	08	80	39	0ED9:38	13	2D	02	2C	C0	8A	79	8F	1139:C7	C9	FF	D0	08	01	0F	09	2A
0C81:81	00	9C	00	10	03	02	A0	1F	0EE1:80	F1	42	AD	80	03	35	38	90	1141:02	AB	67	00	EE	02	55	53	B9
0C89:81	22	00	06	00	72	02	40	59	0EE9:E9	0C	4A	4A	AA	76	00	14	2F	1149:24	C9	38	D0	03	A0	12	80	43
0C91:04	03	80	06	8A	00	18	C8	2A	0EF1:87	04	06	C0	42	E4	10	18	7D	1151:CE	03	A2	03	10	70	06	0C	7A
0C99:00	09	00	01	01	04	01	00	1E	0EF9:A9	28	D1	A1	C2	23	F0	18	E5	1159:81	00	FD	4E	46	06	07	00	39
0CA1:A2	00	AC	03	0E	E2	7E	FD	C7	0F01:8A	65	FD	85	FD	0E	B8	65	D4	1161:F0	12	AE	EB	0A	79	12	0D	7C
0CA9:42	FA	27	2E	F0	30	59	AB	10	0F09:FE	3B	1D	A5	FE	54	70	D4	72	1169:9A	38	48	C8	F8	06	2D	39	EF
0CB1:04	F0	08	AA	CE	41	1C	4C	B3	0F11:85	FE	60	20	AF	13	20	50	1A	1171:0E	70	DE	00	DE	9C	04	40	44
0CB9:A3	10	4A	86	05	08	CE	34	73	0F19:13	A9	23	CA	B8	E3	58	2F	07	1179:35	10	99	F0	3A	DF	6C	64	0B
0CC1:14	D0	10	E4	00	20	20	80	A9	0F21:18	30	0A	A8	C6	C4	29	3F	0E	1181:B8	F0	27	56	07	07	8D	59	4F
0CC9:AF	5F	D1	59	04	E0	18	14	49	0F29:C9	28	B0	F7	AA	20	D5	12	5F	1189:2F	80	3F	C0	58	D8	8D	31	C9
0CD1:DF	0C	01	86	A2	48	F0	0F	8C	0F31:D0	F1	CE	AA	AD	8A	03	3A	90	1191:81	84	70	9C	FA	01	86	09	5F
0CD9:A0	24	86	CE	61	D6	73	C6	1D	0F39:06	04	CC	01	AA	8A	29	03	D9	1199:88	0F	07	AA	4C	B6	16	D8	91
0CE1:0B	AA	AC	16	04	D0	74	20	8D	0F41:09	80	00	70	03	40	20	FE	63	11A1:74	00	97	F0	1F	B0	10	E7	C3
0CE9:F0	E0	29	FB	84	4E	E0	A0	0F	0F49:12	B0	85	01	91	FD	EE	2F	EE	11A9:C3	1C	23	13	FE	44	2D	DA	88
0CF1:FB	A9	20	85	FC	3D	0F	D8	A2	0F51:C2	27	05	A9	20	40	09	04	ED	11B1:60	2C	BD	73	0C	00	64	E3	0B
0CF9:85	FE	A2	08	E8	76	B1	FD	EB	0F59:88	05	99	28	06	99	E8	06	21	11B9:1D	98	8A	B2	F0	19	B0	0D	67
0D01:91	FB	88	D0	F9	E6	FC	E6	4D	0F61:88	D0	F1	80	71	0E	34	E1	4C	11C1:92	21	09	F0	10	FE	13	58	A0



PROGRAMS

1241:4F	A2	01	E8	60	BB	48	1A	01	14A1:18	4C	F0	FF	A0	A7	3C	12	35	1701:BD	80	88	35	1C	AD	A7	11	8A
1249:D9	D0	F6	A9	04	12	AB	AD	75	14A9:D0	A0	62	10	A7	62	27	9E	63	1709:F0	25	CE	62	0E	D0	0D	00	C6
1251:41	9D	91	C7	00	9D	08	0E	C0	14B1:8A	0D	E8	9F	8A	03	79	2A	F6	1711:77	01	86	62	A5	D0	13	4C	15
1259:9D	E6	79	80	0A	9D	02	BD	C5	14B9:36	64	7C	2A	42	38	AD	BC	53	1719:30	1E	B5	00	AD	1B	D4	29	4A
1261:77	0E	2D	43	6A	02	C1	09	86	14C1:28	E0	2B	40	A8	16	0F	E9	45	1721:77	8D	23	68	F0	19	60	1B	21
1269:14	03	60	66	35	43	A9	5F	34	14C9:00	0D	86	5A	C4	6C	BC	6F	6C	1729:4C	9F	1E	20	98	E0	15	23	C0
1271:A1	2A	97	25	E0	23	15	9D	91	14D1:C0	4C	34	1B	A0	0C	C4	AE	13	1731:10	20	D7	14	2A	20	7F	15	91
1279:60	21	B9	0A	1F	01	2C	9D	E0	14D9:D0	34	03	30	50	15	72	50	E6	1739:A9	01	A2	00	20	18	11	D0	25
1281:43	60	50	C2	E2	F0	54	DE	FB	14E1:32	12	64	9A	84	0D	AF	C9	5F	1741:71	A6	4F	79	22	02	84	E6	5C
1289:E3	4C	E0	00	F0	0C	E0	07	4F	14E9:0A	B0	03	20	54	1C	AE	86	9C	1749:01	1E	9A	B8	19	A9	04	A2	78
1291:F0	21	AA	F8	0E	64	4C	57	4D	14F1:67	00	20	55	07	AE	72	04	03	1751:02	6C	83	08	A2	03	3C	83	A9
1299:18	76	AC	19	8C	90	02	38	71	14F9:68	4C	CD	BD	A0	21	20	BB	84	1759:10	A2	04	3C	83	20	A2	05	63
12A1:10	92	FE	13	52	74	00	88	70	1501:1A	C2	15	0A	87	0D	39	00	0F	1761:3C	83	40	A2	06	20	1C	1C	C5
12A9:53	02	60	83	1A	C7	1B	80	E2	1509:AD	23	0E	17	4A	4A	29	0F	E2	1769:A9	80	8D	38	0E	49	FF	8D	E4
12B1:37	8D	AA	85	86	02	2E	33	4E	1511:18	69	31	00	3C	BB	A9	04	EF	1771:39	0E	A2	07	8E	1E	DC	DE	0A
12B9:51	10	29	7F	90	01	01	00	32	1519:82	2C	12	11	09	AA	A9	98	C1	1779:7E	22	02	FE	17	20	DC	1B	AD
12C1:8D	EB	8D	58	B8	FE	27	D0	BF	1521:9D	23	04	CA	D0	F8	E3	A3	E5	1781:20	C8	C0	19	8C	0F	20	C2	3F
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12D9:52	60	42	29	01	AE	3A	0C	5D	1539:68	0E	20	23	40	B0	83	CE	EB	1799:A2	18	20	BD	40	FC	B6	A0	03
12E1:AC	89	00	8E	8E	86	8C	43	92	1541:80	58	20	C8	60	88	AC	00	D0	17A1:84	40	1E	AB	20	FE	10	08	C5
12E9:3C	00	A4	8A	09	BD	14	54	25	1549:08	89	CD	66	B0	0B	82	EA	9B	17A9:8D	0F	D4	AD	36	86	41	55	7B
12F1:A8	BD	62	84	BC	20	B6	12	54	1551:0A	4A	90	07	4C	D9	50	0C	7A	17B1:A9	1F	CC	A4	27	1E	93	0A	7F
12F9:EC	1F	79	09	22	CC	20	8C	2D	1559:60	38	ED	37	60	1E	F0	4C	9C	17B9:C8	10	9C	4C	1B	1F	AD	92	2F
1301:1D	48	7A	01	04	35	40	C3	60	1561:37	1B	60	06	01	D0	1C	AD	8B	17C1:F0	34	CE	31	00	27	2A	1B	6E
1309:83	B5	A0	20	15	5A	00	DD	05	1569:33	92	17	AD	32	0E	D0	12	0D	17C9:A9	DC	18	6D	58	8D	2F	0E	43
1311:30	CC	F0	05	30	03	CE	FD	1A	1571:80	CF	35	9B	83	49	1C	54	FD	17D1:A9	05	6D	80	05	8D	30	28	B2
1319:03	3C	0A	71	C9	06	71	29	9A	1579:00	46	41	B1	50	B0	04	36	FB	17D9:C1	1A	A9	21	02	09	20	8D	B8
1321:2A	00	D0	F0	5C	C1	5C	0A	32	1581:02	0B	A2	12	26	49	80	1C	58	17E1:12	D4	A9	50	8D	32	78	20	CE
1329:C3	9E	5D	43	F0	58	5A	19	6F	1589:90	AD	87	69	40	4A	C0	4C	E7	17E9:80	0F	CE	37	0E	D0	F8	4C	5B
1331:37	F0	11	AD	FF	07	C9	34	10	1591:C1	1A	DD	4C	02	4F	38	02	63	17F1:ED	1E	01	72	83	D0	F9	AD	E6
1339:F0	0A	A9	12	8D	64	73	0C	A1	1599:2B	22	FC	16	40	1D	01	5B	B6	17F9:01	DC	29	10	F0	F9	A9	00	C8
1341:A9	10	8D	5B	AD	1E	0E	0A	B3	15A1:12	20	63	1A	60	B9	1D	19	2B	1801:8D	15	D0	4C	D3	1C	AD	00	86
1349:AA	AD	10	01	4E	38	27	3A	1E	15A9:78	4C	8A	09	48	D8	20	D0	B8									
1351:33	B2	50	5C	C0	C2	B0	27	27	15B1:FB	20	E1	FF	F0	FB	28	F8	DE									
1359:AD	DE	15	5C	21	C8	02	34	DA	15B9:DF	60	A9	30	4C	66	20	D7	38									
1361:90	1B	D1	42	38	ED	B5	B0	8A	15C1:0F	A9	18	A2	C6	81	02	78	C3									
1369:B0	0F	25	0E	18	6D	22	0E	F9	15C9:1B	8A	20	80	D4	21	C8	11	FD									
1371:DD	CE	3D	90	03	24	06	DF	7F	15D1:8D	05	88	09	0C	C8	13	98	E7									
1379:01	82	06	8C	01	63	46	2E	9A	15D9:10	F1	8D	06	18	01	8D	08	82									
1381:5E	47	2E	19	AD	0B	29	03	EE	15E1:81	11	FB	8D	0D	18	F6	8D	AD									
1389:D0	52	01	E9	0B	C5	00	1C	F6	15E9:14	81	1D	0C	80	25	19	0B	21									
1391:2B	51	32	32	4C	B9	1B	20	AA	15F1:8D	26	81	11	80	28	8A	40	A7									
1399:90	1A	AD	00	4B	FC	2D	40	2D	15F9:40	29	B4	08	2A	88	2C	80	F1									
13A1:0E	35	AD	C8	CD	2E	83	AC	39	1601:08	2B	C8	2D	81	1C	80	8D	F2									
13A9:0A	05	00	D0	28	55	01	D0	8C	1609:17	18	1D	BF	10	FC	48	35	A0									
13B1:23	AD	E0	8E	05	1A	F1	00	4E	1611:74	31	8D	F9	1A	04	DC	FA	AA									
13B9:36	13	3A	28	44	03	12	1C	F7	1619:8A	FB	80	08	FC	88	FD	07	27									
13C1:4B	00	FA	F0	D6	45	00	33	FA	1621:8D	FE	07	A9	0F	00	F0	58	02									
13C9:0E	EE	32	13	20	A0	AD	07	10	1629:D4	D1	0E	D4	AD	E0	01	84	BA									
13D1:C5	FA	AD	4D	5F	D0	F5	AD	FB	1631:5C	C6	DD	88	20	7A	14	A9	3E									
13D9:96	D0	F0	49	9B	EB	39	07	38	1639:C9	8D	2B	07	3F	04	8D	2C	D4									
13E1:F0	E6	20	1D	16	2D	24	80	3E	1641:B0	03	60	07	A8	22	1A	40	45									
13E9:00	D0	17	CE	2B	2D	1D	2D	89	1649:58	03	88	77	D8	00	06	13	D0									
13F1:85	60	83	60	A9	FF	4B	24	71	1651:A9	81	8D	0B	D4	60	70	04	22									
13F9:5A	1A	AB	67	A0	F0	19	3E	F8	1659:A2	09	6A	C8	DE	69	88	0D	AD									
1401:9B	1F	C9	01	F0	26	98	AA	04	1661:A2	0C	AF	21	EC	A7	61	A0	53									
1409:DE	1C	BE	4C	16	42	07	41	4D	1669:12	A2	8F	19	EA	00	FB	8C	A6									
1411:72	4C	1B	1A	D0	AD	41	45	8F	1671:E4	46	39	80	C3	A3	0E	80	1A									
1419:A9	06	8D	48	49	2E	D0	8D	FF	1679:B1	9C	A9	93	20	D2	FF	A9	0A									
1421:58	88	2E	3C	62	93	A9	7D	53	1681:40	C1	75	01	16	AD	00	5E	C2									
1429:05	12	87	41	20	F0	0C	B9	F3	1689:08	0A	8D	00	1D	08	90	38	50									
1431:E6	29	C0	F0	15	09	1F	4C	95	1691:E9	32	8D	2C	BB	A9	09	8D	D7									
1439:57	1A	CE	2C	06	F2	6C	7F	84	1699:16	A1	1A	80	08	18	88	19	4F									
1441:1B	A9	E1	20	0A	1C	AC	E1	9B	16A1:80	08	1B	08	1C	83	10	40	43									
1449:22	C0	99	80	90	6D	88	01	3A	16A9:07	B1	B8	40	22	44	8D	8A	A8	</								

How to Type In COMPUTE's Gazette Programs

Each month, Gazette publishes programs for the Commodore 128 and 64. Each program is clearly marked by title and version. Be sure to type in the correct version for your machine. All 64 programs run on the 128 in 64 mode. Be sure to read the instructions in the corresponding article. This can save time and eliminate any questions which might arise after you begin typing.

We regularly publish two programs designed to make typing easier: *The Automatic Proofreader*, for BASIC programs, and *MLX*, for entering machine language programs.

When entering a BASIC program, be especially careful with DATA statements, as they are extremely sensitive to errors. A mistyped number in a DATA statement can cause your machine to "lock up" (you'll have no control over the computer). If this happens, the only recourse is to turn your computer off and then on, erasing what was in memory. This could cause you to lose valuable data, so be sure to *save a program before you run it*. If your computer crashes, you can always reload the program and look for the error.

Special Characters

Most of the programs listed in each issue contain special control characters. To facilitate typing in any programs from Gazette, use the following listing conventions.

The most common type of control characters in our listings appear as words within braces: {DOWN} means to press the cursor-down key; {5 SPACES} means to press the space bar five times.

To indicate that a key should be shifted (hold down the Shift key while pressing another key), the character is underlined. For example, A means hold down the Shift key and press A. You may see strange characters on your screen, but that's to be expected. If you find a number followed by an underlined key enclosed in braces (for example, {8 A}), type the key as many times as indicated (in our example, enter eight shifted A's).

If a key is enclosed in special brackets, [F], hold down the Commodore key (at the lower left corner of the keyboard) and press the indicated character.

Rarely, you'll see a single letter of the alphabet enclosed in braces. This can be entered on the Commodore 64 by pressing the Ctrl key while typing the letter in braces. For example, {A} means to press Ctrl-A.

The Quote Mode

You can move the cursor around the screen with the Crsr keys, but you may want to move it under program control, as in examples like {LEFT} and {HOME} in the listings. The only way the computer can tell the difference between direct and programmed cursor control is the quote mode.

Once you press the quote key, you're in quote mode, which can be confusing if you mistype a character and cursor left to change it. You'll see a graphics symbol for cursor left. Use the delete key to back up and edit the line. Type another quotation mark to get out of quote mode. If things get too confusing, exit quote mode by pressing Return; then cursor up to the mistyped line and fix it. If the mistake involves cursor movement, you must press the quote key to reenter quote mode. □

When You Read:	Press:	See:	When You Read:	Press:	See:	When You Read:	Press:	See:
{CLR}	SHIFT CLR/HOME		{PUR}	CTRL 5				
{HOME}	CLR/HOME		{GRN}	CTRL 6				
{UP}	SHIFT ↑ CRSR ↓		{BLU}	CTRL 7				
{DOWN}	↑ CRSR ↓		{YEL}	CTRL 8				
{LEFT}	SHIFT ← CRSR →		{F1}	f1				
{RIGHT}	← CRSR →		{F2}	SHIFT f1				
{RVS}	CTRL 9		{F3}	f3				
{OFF}	CTRL 0		{F4}	SHIFT f3				
{BLK}	CTRL 1		{F5}	f5				
{WHT}	CTRL 2		{F6}	SHIFT f5				
{RED}	CTRL 3		{F7}	f7				
{CYN}	CTRL 4		{F8}	SHIFT f7				

When You Read:	Press:	See:
	SHIFT ↑	

For Commodore 64 Only		
[1]	COMMODORE 1	
[2]	COMMODORE 2	
[3]	COMMODORE 3	
[4]	COMMODORE 4	
[5]	COMMODORE 5	
[6]	COMMODORE 6	
[7]	COMMODORE 7	
[8]	COMMODORE 8	